

1934-35

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# MECHANICAL CATALOG

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INDEX TO MANUFACTURERS OF INDUSTRIAL EQUIPMENT, MATERIALS AND SUPPLIES

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*Twenty-Fourth*  
ANNUAL VOLUME

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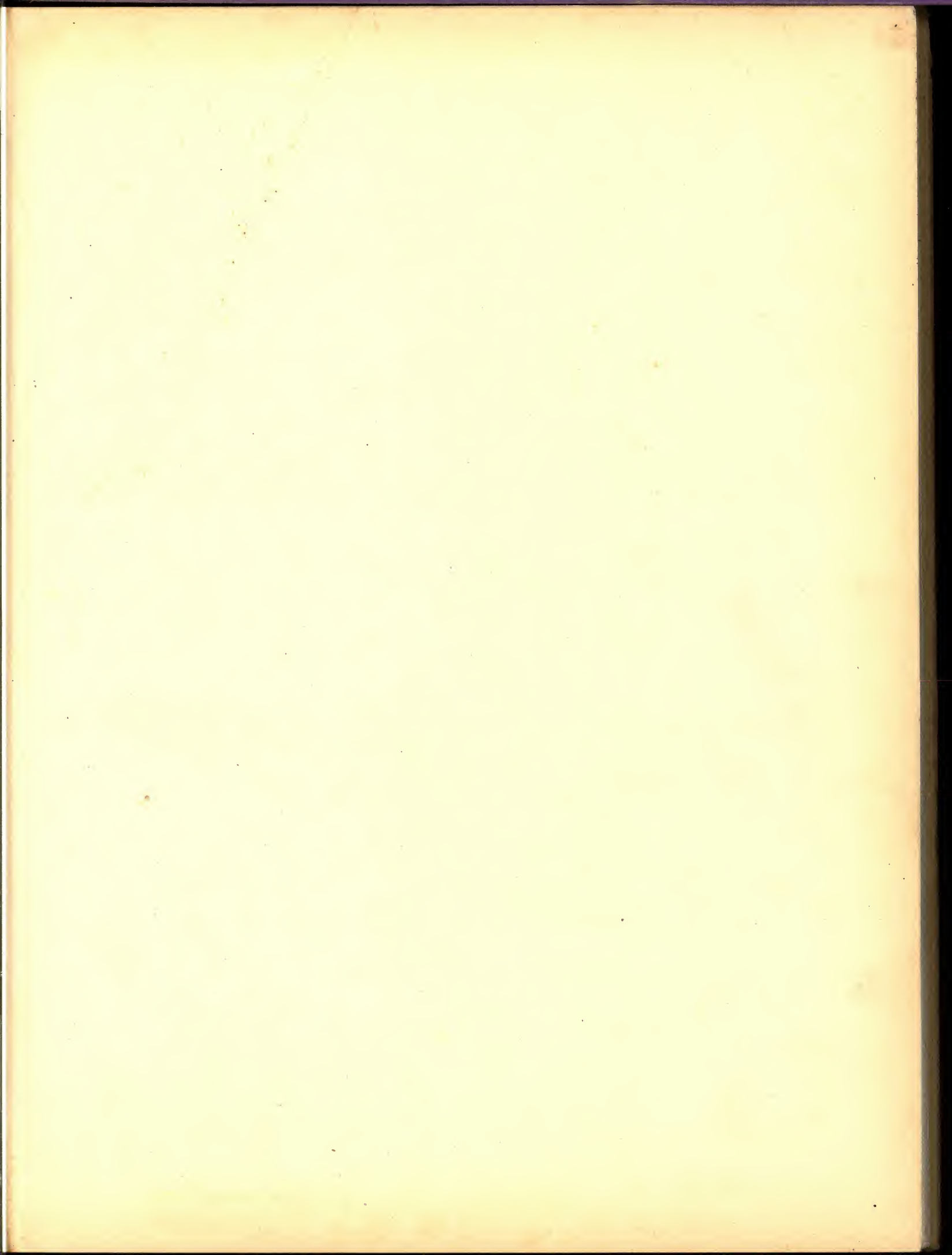
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OF INDUSTRIAL EQUIPMENT,  
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1934-35

TWENTY-FOURTH ANNUAL VOLUME

ISSUED OCTOBER 1934

Copyright 1934

PUBLISHED BY  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS  
29 WEST 39th STREET NEW YORK, N. Y.





# PREFACE

## The 1934-35 Edition of the MECHANICAL CATALOG

For the use of the membership of the A.S.M.E.  
and the mechanical engineering profession at large

This new volume marks the 24th year of reference service to industry.

The MECHANICAL CATALOG is a "basic utility" in the mechanical engineering field and supplies engineers most effectively with a knowledge of products for preliminary plans and layouts. It serves as a handy substitute for manufacturers' catalogs when they are not on file, as a ready index when they are and as basis of inquiry for individual catalogs when required.

Previous to last year the full page was the minimum space unit carried, but we recognized the fact that in some instances less space would serve and so introduced half pages in the 1933-34 issue. Even a cursory investigation of reference catalogs shows that in most cases a number of products are described on each page and the manufacturer with only one or, at best, a few products does not always require this amount of space. The half page unit is successfully continued in this issue.

In its annual publication of the MECHANICAL CATALOG, in which space is sold at stated rates, the A.S.M.E. provides a closer and more efficient contact between the user and maker of industrial equipment and acts as a logical agent rather than a publisher in the usual sense of the term.

## LISTINGS

Product listings form an essential part of a properly organized reference service. When technically correct and adapted to practical field requirements and verified as to manufacturers' names, addresses and products they constitute an invaluable and much used source of information. This has been proved in our own experience of more than twenty years.

Therefore, the "INDEX TO MANUFACTURERS OF INDUSTRIAL EQUIPMENT, MATERIALS AND SUPPLIES" is continued upon the same basis as last year—a charge being made for each listing under a specific product heading to concerns whose descriptive data does not otherwise appear.

The A.S.M.E. is a logical and qualified central agency to publish such a specialized list of manufacturers whose products find application in the mechanical engineering field and is operating this compilation *at cost*, for each firm is asked to pay *only* the production expense of the listings they use.

Advertisers are identified in "Index to Manufacturers" by a (\*) preceding their name and have the page number or numbers of their catalog after their name to facilitate reference to descriptions of their products. As a convenience to the user those firms presenting catalogs are grouped first.

FREDERICK LASK,  
*Advertising Manager*

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An alphabetical list of firms presenting catalogs in this issue, giving their page number and a short historical sketch of the company.

## CATALOGS OF ADVERTISERS . . . . . Beginning Page 1

A detailed description of thousands of items used by industry in manufacturing its products and in building and maintaining its plants. Catalogs are arranged in alphabetical order subject to some variation due to make-up.

## INDEX TO MANUFACTURERS . . . . . Beginning Page 225

A classified list of thousands of items used by industry and also the index to the specific product descriptions provided by the advertisers in their catalogs in this volume.



## HOW TO USE THIS BOOK

This volume is arranged, indexed and cross-indexed to make it possible for the user to have its complete contents available without tedious searching.

As most inquiries start with the search for a specific product, attention is first directed to the Index To Manufacturers (*yellow pages*). Here, under the product classification, will be found a list of manufacturers making the product, with their addresses.

Heading these lists are the manufacturers who present catalogs. By turning to the page number following their name, the user will find such data as branch offices, agents, detailed descriptions of products, manufacturers' bulletin numbers, etc.

In some instances information will be found lacking, or possibly an error or omission will be noted. The Society will appreciate learning of these and will aid the inquirer in locating the information sought. Address the Catalog Department, American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y.

Where firms in whose products you are interested have omitted descriptions, your co-operation is invited in bringing this to the attention of the firm or the publisher. Also, if the book has aided you, please inform the manufacturer that his data in the Mechanical Catalog was of help to you.

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# INDEX TO CATALOGS

This new type of index is to acquaint you with the background and traditions of American Industry as represented by the firms whose products are described in this issue of MECHANICAL CATALOG. An effort has been made to secure from the advertiser institutional copy void of controvertible statements.

You are invited to consult the catalogs for details concerning products, addresses of home and branch offices, engineering service available, etc.

## A

### Abart Gear & Machine Co..... 1

Originally organized to manufacture precision cut gears, special speed reducers and gearing for those who require high grade products. Since then have added through purchase the Goodwill Tools, Patterns and Drawings of the Albaugh-Dover Mfg. Co., and continue to manufacture the complete standard line of Speed Reducers. Also maintain an engineering department at your disposal which can cope with any gearing or speed reduction problem you require.

### Air Preheater Corp'n (Under management of The Superheater Company).....198, 199

Organized in 1925 to manufacture the Ljungström air preheater, first introduced in this country in 1923 by James Howden Co. of Glasgow, Scotland, pioneer manufacturers of air preheaters, who made their first installation in 1880. The Ljungström regenerative air preheater is very generally used in modern central stations and industrial boiler plants, and, in addition, has been successfully applied for saving fuel on oil stills, incinerators, metallurgical melting furnaces, etc.

### Alco Products (Inc.)..... 2

Alco Products, Incorporated, a division of American Locomotive Company, is engaged in the business of engineering, designing, fabricating and erecting Gyro Vapor Phase Cracking Plants, Atmospheric and Vacuum Distillation Units, Tube Stills, Fractionating Towers, Treating Plants, Gasoline Absorption, Stabilizing and Debutanizing Plants, Fluor Cooling Towers, and all types of Heat Exchange Equipment and general Steel Plate Work, including Alco Electric Welded Steel Pipe. Alco Products, Inc., are Licensing Agents for Gyro Vapor Phase Cracking, Gray Processes Clay Treating, and Stratford Acid Treating System.

### Alemite Corp'n..... 3

Subsidiary of Stewart-Warner Corporation, 1826 Diversey Parkway, Chicago. Organized in 1913. Today Stewart-Warner Corporation, including its Alemite and Bassick divisions, manufactures and sells a diversified line of automotive and household products, chief of which are speedometers, fuel pumps, lubrication systems and lubricants, radios, electric refrigerators, casters and automobile hardware.

### Allis-Chalmers Mfg. Co..... 4, 5, 6, 7

Builders of a large variety of power, electrical, industrial, and agricultural machinery. This company, formed by a consolidation of leading pioneer firms in 1900, has experience extending over eighty years, with installations of engines, turbines, and water-wheels aggregating seventeen million horsepower; pumps of total capacity eight billion gallons per day; and machinery for rock and ore plants, flour and lumber mills, etc., the world over. Recent acquisitions and developments have greatly widened the diversified line of products enabling Allis-Chalmers to serve many industries; to share in the electrification of industry and railways and to supply tractors, farm, and road machinery.

### American Arch Co. (Inc.)..... 8

Industrial Department was established over ten years ago for the development and application of suspended arches, sectionally supported refractory air cooled walls, as well as insulated sectionally supported walls for all types of furnaces for industrial plants, power plants, steel mills, oil stills, and incinerators. The use of the most suitable materials, as obtained from leading refractory manufacturers, combined with competent and experienced engineering service are the customer's assurance of a successful and economical installation.

### American Blower Corp'n..... 9

Has manufactured air conditioning equipment for the past fifty years. Among the more prominent products are the Series 30 and H.S. fans, unit heaters, dust collectors, and all types of air conditioning equipment.

### American Brass Co..... 10

Has had more than a century's experience in the production of copper and copper alloys. Its present line includes copper, brass, bronze, nickel silver, and special copper alloys in every combination that can be wrought into sheets, strips, plates, wire, rods, tubes, forgings, extruded and drawn eccentric shapes. The company's technical department is prepared to assist metal users in selecting the most satisfactory copper alloy for any specific purpose.

### American Cable Co. (Inc.)..... 11

### American District Steam Co..... 12

Manufacturers since 1877 of Expansion Joints, Underground Steam Line Conduit, Condensation and Steam Flow Meters, Water Heaters, Steam Traps, Reducing Valves, Vapor Heating Specialties. Outstanding in the company's growth has been the development of equipment for, and the promotion of, District Steam Heating Systems. An Engineers' Service Department is maintained to cooperate with consulting engineers and architects on any major steam or hot water distribution piping installations.

### American Engineering Co..... 13

An organization with over sixty-five years' experience in the engineering, design, and manufacture of high grade machinery. Designers and manufacturers of the Taylor Stoker, AECO furnace walls, stoker ash hoppers, and ash sluicing systems, Lo-Hed monorail electric hoists. This company was the first builder of hydraulic steering gears for commercial and Navy vessels. Also designers of capstans, windlasses, and other marine equipment. Designers of the Juruick ammonia compressor used for cooling purposes and air conditioning. AECO Hydro-Thermal Grids are used for cooling coils with all refrigeration equipment. This company operates foundries making castings for other manufacturers.

### American Gas Furnace Co..... 223

### American Manganese Bronze Co... 14

Founders, Engineers, and Metallurgists, was established in 1908. This company operates an extensive, well-equipped bronze foundry, casting non-ferrous metals of practically every commercial kind. They spe-

cialize on high test alloys for engineering purposes and corrosion resisting metals for the chemical trade. Some of the largest bronze castings ever made have been products of this foundry, notably those for the New York City Water Supply (Catskill Aqueduct); the Roosevelt Dam and other Reclamation Service hydro-electric installations; the Panama Canal; propellers for the U. S. Navy, and for the largest ships. This company's metals are specified and used in a great variety of industries.

### American Metal Hose Co..... 15

Organized and incorporated in 1908. As new fields and uses for metal hose and flexible metallic tubing were developed, the organization grew until, at the present time, it is devoting over 100,000 square feet of floor space exclusively to the manufacture of these products. A technical staff is maintained for the purpose of aiding engineers in the solution of metal hose problems.

### American Pulverizer Co..... 16

For twenty-five years this company has been manufacturing American Rolling Ring Crushers, Pulverizers and Shredders. They maintain a complete engineering department and are equipped to solve your crushing and reduction problems. There is available a testing plant for prospective users of their equipment. They will gladly make crushing tests, without obligation, on any material shipped to them f.o.b. their plant.

### American Screw Co..... 11

This business was established in 1838 and 1840 by two independent Rhode Island corporations, which united and were incorporated under the present title in 1860. The company is the pioneer, as well as the largest, among the survivors in its industry with large plants in Providence, and a branch, the Reading Screw Company, at Norristown, Pa.

### American Steam Pump Co..... 17

Was organized in 1873 and today is nationally known as one of the leading manufacturers of pumping equipment, building a complete line of centrifugal, power and steam pumps. Mr. Richard R. Hicks is president; Mr. William Oakley, sales manager. All pumps produced are marketed under the trade-name, American-Marsh Pumps. American-Marsh Centrifugal Pumps are offered in many types, not only to meet all water handling requirements, but for handling any other kind of liquid that occasion may demand. American-Marsh Power and Steam Pumps are available in simplex and duplex types to meet practically any capacity and pressure condition. American-Marsh Pumps have the acceptance of engineers generally due to sound engineering and strict adherence to quality standards.

### Andale Co..... 18, 19

### Anthony Co..... 20

This company, which was established in 1910, is an outgrowth of the American Combustion Co. organized to develop mechanical Nebulizers for combustion purposes. It has continued this development and has succeeded in adapting this form of nebulization for oil fuel in every conceivable kind



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of industrial process requiring heat. They are manufacturers of most of the equipment items which enter into fuel oil installations and combine this with the manufacture of equipment for gas fuel installations.

## Atlantic Metal Hose Co. (Inc.)..... 14

Incorporated in 1914 as Atlantic Metal Hose Co., has concentrated and specialized in Flexible Metallic Hose for the Engineering, Mechanical and Technical Field. Nationwide experience and a well trained engineering staff have made Atlantic Metal Hose standard with many prominent concerns. The company maintains sales representatives in several large cities in the United States.

## Automatic Primer Co..... 223

## B

## Babcock & Wilcox Co.... 22, 23, 24, 25

Since 1867, when the patent was granted for the original Babcock & Wilcox boiler, the history of the company has been one of steady growth and progress. The present company was incorporated in 1881, the year of the birth of the electric generating station. Boiler units are now built in all sizes, complete in every important respect, and other products, of the company and its subsidiaries include process equipment, seamless tubular products, and refractories. The motive of the company has always been, and is, that of giving the best and most satisfactory service; of furnishing the best in ideas, information, material, and workmanship; of justifying the faith of its customers.

## Badger, E. B., & Sons Co..... 21

One of Boston's oldest concerns was established in 1841 as coppersmiths both to the industries and the building trades. As the country developed and process work expanded, Badger expanded its line to include all kinds of processing equipment in which copper and other metals play a part. Most noted in the power plant field are the Badger Directed Flexing, Self-Equalizing Expansion Joints. The company also maintains engineering departments for developing projects in the chemical process, oil refining, and liquor distilling industries. This company is now making the well-known Brown & Bros. Copper Range Boiler.

## Bailey Meter Co..... 26, 27

Founded by E. G. Bailey in 1916 following his invention of the Bailey Boiler Meter; this company has expanded rapidly. Many new meters, recorders, regulators, and controls have been added to the list of products. Bailey meter equipment is installed in over 90% of the central stations in this country and in hundreds of industrial plants.

## Bakelite Corp'n..... 30

This business was established twenty-four years ago and was founded by Dr. L. H. Baekeland. From a small beginning, it has grown to a point where it now has large, modern manufacturing plants and representatives in all the major industrial centers of the country, as well as affiliations in the leading industrial countries in the world. The products manufactured cover a wide range of plastic materials, including transparent resinoids, molding materials, laminating materials, baking type varnishes, lacquers, cements, and enamels, synthetic resins for air-drying finishes, resinoids for bonding abrasive products, and automobile brake linings, and for waterproofing fabrics.

## Barco Mfg. Co..... 28, 29

Is a pioneer in the manufacture and sale of flexible ball joints and in handling the technical problems relating to their use under all pressures and vacuums. The company was started on Friday, March 13, 1908, and has continued without interruption in this work and in the manufacture and sale of railway locomotive and car specialties.

## Barnes Drill Co..... 31

Organized and incorporated in 1907. The original officials were experienced in machine tool building and at once developed their invention of the first "All Geared" Drilling Machine. The Company has specialized in these products through all the years,

having today a very complete line of highly improved SELF-OILING ALL GEARED Drilling and Tapping Machines. In 1925 these engineers pioneered the development of Honing Machines with hydraulically reciprocated spindles for automobile cylinder honing, singly and in multiple. Today the very complete line of Hydraulic Honers covers the complete range of honing, both vertical and horizontal, for all classes of cylinder bores of almost any diameter and any length. The Company's technical staff is competent to aid production engineers in the solution of their problems in boring, drilling, reaming, facing, tapping, and honing.

## Barnes-Gibson-Raymond (Inc.)..... 31

Established by three of the country's oldest spring plants, to serve the great industrial area around Detroit with high-grade springs, wire forms and small stampings. Have had considerable experience in designing and manufacturing springs for the automotive field. Recognized for valuable research and experimental work in connection with metals and finishes. Plant equipment up to the minute—heat treating equipment varied and ample for quantity work. In 1929, acquired the plant of Cook Spring Co. at Ann Arbor, Michigan, now known as Cook Spring Co. Division of Barnes-Gibson-Raymond, Inc. Detroit Division located at 1600 Miller Avenue. "Two plants for Spring Service."

## Barrett-Cravens Co..... 34

Manufacturers of hand operated Lift-Trucks of both the single and multiple lift types in capacities ranging from 2500 to 10,000 lb.; Skid Platforms—in a standard design so that they can be used with all makes of trucks; Portable Elevators, hand and electrically operated of any specifications, piling height and speed required; also Barrel Trucks and Barrel Storage System.

## Barrett, Haentjens & Co..... 32, 33

Organized in 1916, specialize in centrifugal pumps, automatic priming and control equipment, check valves, strainers, and complete pumping installations.

## Bartlett Hayward Co..... 35

Founded in 1832. One hundred years of continuous service to industry. Pioneered the first "Structural" Iron Building (forerunner of present-day skyscraper). First Hot Water Radiator—Elevators—Hot Water Heating—Latrobe Stoves. In 1863, built the famous Winans Locomotives. Since 1876, has led in plant and machinery design, manufacture and construction for production of manufactured gas—largest gas plants and gas holders in the world. Since 1919, holding exclusive patent license, have placed in service over 50,000 Fast's Self-Aligning Couplings, aggregating over 100,000,000 horse-power. Complete engineering, design, fabrication, and construction of gas plants, process plants and special equipment.

## Bartlett & Snow Co., C. O..... 36

This concern is recognized in the United States and in many foreign countries for the high quality of its workmanship and the skill of its engineering accomplishments. This concern has won great prominence in the foundry industry, having engineered, constructed and installed complete sand reclaiming and sand reconditioning equipment, mold and finished casting conveyors, and other mechanical equipment in large and small steel, brass, aluminum, gray and malleable iron foundries, including installations in the giant Chevrolet and Buick plants. The company maintains an exceedingly competent engineering department and includes among its personnel experts in the fields covered by products of its manufacture, a completely equipped machine and spacious structural shops, that enables the prospective purchaser to concentrate the entire responsibility for the satisfactory design, construction and operation of a unit in one wholly competent organization.

## Beach-Russ Co..... 37

Established more than 35 years and devoted exclusively to the manufacture and development of Rotary Pumps. Products include: High Vacuum Pumps—delivering the highest known vacuum produced mechanically. Air and Gas Compressors—giving a steady uniform flow of gas under pressure. Rotary Liquid Pumps—all types, handling light and heavy liquids. Special pumps are handling extra heavy cellulose

products. Acid Pumps—special engineering design and attention have been given, over a period of years, to their acid resisting centrifugal pumps. All of these pumps are cast solid (not lined), and are manufactured in all known metals and alloys.

## Bernitz Furnace Appliance Co..... 38

An organization that has specialized for 18 years in producing and developing protective constructions to better utilize high-grade commercial refractories selected for furnace setting work. They have made available several practical air-cooled wall constructions and water wall coverages for various types of furnaces. These have been instrumental in preventing clinker adhesion to furnace walls.

## Bethlehem Steel Co..... 39

The history of this Company dates back over a period of more than 75 years, some of its plants having been established nearly one hundred years ago. Its products include iron and steel for the manufacture of practically every ferrous commodity and in addition produces such finished products and specialties as: castings, forgings, structural shapes, boiler tubes, oil burning equipment, railroad cars, auxiliary locomotives, track work, etc. This organization is equipped with unusual facilities and experience and maintains a traditionally high standard of quality.

## Bigelow Co..... 34

In 1833 Cyprian Wilcox started a foundry and machine shop in New Haven, Conn., on what was known as the Farmington Canal. The business of the company developed into the manufacture of water wheels, engines, and boilers, and in 1860 this company was established. Gradually the manufacture of boilers became its principal product, and today manufactures fire tube and water tube steam boilers up to high pressures and large capacities.

## Bigelow-Liptak Corp'n..... 40

A merger of Bigelow Arch Company (organized 1922) and Liptak Fire Brick Arch Company (founded by Michael Liptak) was incorporated in 1927 and manufactures many types of Furnace Walls and Arches under an extensive list of Bigelow and Liptak patents. The Corporation and one of its predecessors, Bigelow Arch Company, have been under the continuous management of their President, Frank B. Bigelow, the originator of the Unit-Suspension feature in Suspended Arch and Wall construction. The Corporation maintains an extensive and well-experienced Engineering staff at its Main Office, as well as Branch Office engineers. Domestic sales are handled through twenty-five representatives in the United States, Cuba, Philippines and Hawaii, and Foreign sales are negotiated by Licensees at London, Calcutta, Bombay, Sydney, Copenhagen, Brussels, Paris, Berlin, Shanghai, Yokohama, Buenos Aires and Toronto.

## Brassert, H. A., & Co..... 41

Engineers and contractors, includes among its activities, the manufacture, sale, and installation of the Brassert-Askania System of Metered Automatic Control. This system is nearly universal in its application. It covers a wide range of uses in connection with metallurgical furnaces, steam plants, oil refineries, sewage disposal and water treating plants and a great variety of other industrial installations. It regulates pressure, flows, and temperatures and many combinations of these conditions. It operates by means of a unique principle, that of the jet pipe, which gives it an unusual accuracy combined with simplicity, durability, and elasticity in application. The Brassert-Askania line also includes the Ring Balance Low Pressure Flow Meters for air and gas. These meters operate on exceptionally low differential pressures.

## Bristol Co..... 42

Established in 1889 by William H. Bristol. The Bristol Company pioneered the development of the original recording gauge and thermometer, which initiated industry's first attempt to control production. For the first time these early "Bristol" Recorders made it possible by means of continuous chart records to detect any and all variations of pressure or temperature from prescribed standards. They revealed these fluctuations in a form that could be analyzed, filed, and preserved for future reference. From 1889 to 1908 Bristol's Instruments were manufactured in one small building. Today the



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- Bristol plant comprises a number of buildings, each equipped with the most modern facilities for turning out a quality product. Branch offices are maintained in principal cities throughout the country, in four of which complete facilities are available for reconditioning, recalibration, and repair work.
- Brown Instrument Co.**..... 43  
Since 1860 this company has manufactured indicating, recording, and controlling instruments for power plant and industrial processes. The company is one of the largest manufacturers of industrial measuring instruments. Chief products are Pyrometers, Flow Meters, Thermometers, Pressure and Vacuum Gauges, CO<sub>2</sub> Meters, Resistance Thermometers, Tachometers, Remote Valve Mechanisms, and Automatic Controllers. In more than 60 different industries Brown Instruments are used extensively throughout the entire world.
- Buffalo Forge Co.**..... 44  
Enjoying a reputation for unusual engineering ability for many years, this company, established in 1878, has recently been awarded the contract for 28 enormous fans for ventilating the new Boston Vehicular Tunnel under the Charles River. Another unusual job handled by special Buffalo Fans is the ventilation of motor gondolas on the Akron and the new larger dirigible now being built. While the engineering organization is available for consultation on special problems, the standard lines of Buffalo Unit Heaters, Air Washers, Ventilating, and Mechanical Draft Fans, Cooling Units, and Exhaust Fans of all types developed by this same engineering organization are shipped daily all over this country and to most of the world.
- Buffalo Pumps (Inc.)**..... 45  
One of the oldest pump manufacturers in this country, this company recently introduced the Buffalo Self-Priming Pump. The self-priming feature is licensed to Buffalo Pumps, Inc., by the Nash Engineering Co. Being available on both single and double suction pumps, for general service and specialized jobs such as handling sewage, paper stock, and process plant liquids, there is a wide application of these pumps. All traditional features of Buffalo design are retained in the self-priming models. In a substantial number of installations, Buffalo Pumps have made unusual records for efficiency and long service.
- Burt Mfg. Co.**..... 46  
Established more than forty years ago as one of the pioneer builders of oil filters. From a single filter, this company has developed a complete line. Burt has also been very active in other fields, especially as the maker of exhaust heads and roof ventilator developments. A thoroughly experienced engineering department is maintained for the purpose of assisting architectural and industrial engineers in the planning of effective ventilating systems.
- Busch-Sulzer Bros.-Diesel Engine Co.** 47  
Engaged in designing and building Diesel engines; with adequate technical staff and especially equipped Diesel works; guided in design, selection of materials, and workmanship by over thirty years of its own experience in building Diesel engines, both 4- and 2-cycle types, heavy duty slow speed, special light weight high speed, including stationary and marine reversing Diesels; under the direction of Dr. Diesel until 1913; by 15 years (1911-1926) of technical collaboration with the Swiss firm, Sulzer Brothers; and, at present, by the engineering research and technical advice of Allgemeine Elektrizitäts Gesellschaft, of Germany, builders of the first successful solid injection double-acting 2-cycle Diesel.
- Carborundum Co.**..... 48, 49  
In 1891, in Monongahela City, Penna., Dr. Edward Goodrich Acheson created the first silicon carbide crystals in a tiny electric furnace as a result of his searching for a new abrasive material. The new abrasive was given the trade name "Carborundum" by its creator and shortly after this company was organized and chartered under the laws of the State of Pennsylvania. In 1893 the then little plant was moved to Niagara Falls, N. Y. Later on the company began the manufacture of "Alumoxite", the aluminous oxide abrasive. In addition to these abrasive products, this company also manufactures a complete line of super-refractory products made from Carborundum Brand Silicon Carbide.
- Carrick Engineering Co.**..... 50  
Designers, manufacturers and installers since 1916 of fully and partially automatic Combustion Control Systems for coal, oil, gas and other fuels. We also offer a line of Hydraulic Furnace Damper Regulators as well as electric type Furnace Damper Regulators for commercial, industrial and Central Station boiler furnaces. The Carrick Line of individual Control items or complete Combustion Control Systems is designed for many years of continuous service. It has proved itself in hundreds of plants over a period of twenty years.
- Carver, Fred S.**..... 50  
Established 1912—Specializing in Hydraulic Presses for Separating Liquids and Solids—Pioneered the development of the automatic pot type Hydraulic Press, covered by upwards of 35 American and foreign patents. Ninety per cent of the cocoa presses sold in this country during recent years are Carver Presses—Carver presses are used for separating liquids and solids of various kinds, oils, fats, juices, extracts, etc. Also developed the Carver Laboratory Press now universally used by colleges, government departments, experiment stations and hundreds of industrial plants throughout the world.
- Cash, A. W., Co.**..... 51  
Since 1916 this company has been engaged in the manufacture and sale of Automatic Fluid Pressure Control equipment of many outstanding types. Among other things, the present line includes, VALVES: Reducing, Relief, Pilot, Balanced Lever, GOVERNORS: Pump, Volume Flow, Liquid Level, and Vacuum Controllers. Blower and Fan Engine Regulators. Strainers. For Refrigeration use: Automatic Expansion Valves, Back Pressure Control Valves, Condenser Water Regulators, Strainers. Supersensitive Draft Regulators; and a complete line of Automatic Combustion Control Equipment including complete automatic systems for boilers of any size.
- Chain Belt Co.**..... 52  
Was organized in 1891 with an original capitalization of \$11,000.00 and is now in the forty-third year (1934) of its existence. The first product to be made was Malleable Chain, but the line has since broadened to include practically all types of industrial chains for power transmission and carrying purposes. In 1900 the elevating and conveying line was added and in 1908 concrete mixers. This latter line has since broadened out and today includes many other construction machinery units such as pumps, saw rigs, plaster mixers, and recently the new Pumpcrete, a device for pumping concrete, was added. In 1926 the Stearns Conveyor Co. of Cleveland became part of the Chain Belt Co. This unit specializes in belt conveyor idlers.
- Chaplin-Fulton Mfg. Co.**..... 53  
"Fulton" Regulators are one of the pioneers of pressure reducing valves and regulators in this country. They were first made by this company in 1887, and they continue to be considered as one of the standards of regulation for steam, gas, oil, water, and all gases and liquids.
- Chicago Bridge & Iron Works**..... 54  
Designers, fabricators and erectors of steel tanks and steel plate work of all kinds including elevated steel tanks for municipal, industrial and railroad service; storage tanks for water, molasses, oil, etc.; Wiggins Pontoon Roofs, Wiggins Breather Roofs, Hortonspheres, Hortonspheroids and radial cone tanks for the prevention of evaporation loss from oil storage; Hortonspheres and vertical bullets for gas storage; and special tanks for chemical plants, breweries, distilleries, etc. Fabricating plants at Birmingham, Alabama; Chicago, Illinois; Greenville, Pennsylvania, and Fort Erie, Ontario (In Canada, Horton Steel Works, Limited). Built up structures shipped complete and large installations erected with the company's own field forces.
- Chicago Pump Co.**..... 56  
Established a quarter of a century ago, this company has earned a place foremost in the ranks of centrifugal pump manufacturers by honest manufacture of quality products. They strive to produce long-life pumps and pumping equipment that give the best service and results and to make easy the replacement of parts. Their products include the following: Sewage ejectors, bilge or sump pumps, electric cellar drainers, screw-feed sludge pumps, horizontal centrifugal pumps, hot or cold water and brine circulating pumps, vacuum heating pumps, condensation pumps, pneumatic water systems, "Automatic Alternator" for duplex pumps to transfer the operation from one pump to the other, aerators for aerating sewage, liquid sewage samplers, "Comminutor" or chopper screens, speed screens and water seal pumps.
- Chicago Tubing & Braiding Co.**..... 55  
Manufacturers of Flexible Metallic Hose for more than thirty-two years. This concern has pioneered in introducing many different styles of Flexible Metal Tubing and has been instrumental in introducing its use for many commercial and industrial activities. Their leadership in this respect becomes an invitation to industrial engineers to consult with this company whenever their needs seem to indicate this kind of a product.
- Chisholm-Moore Hoist Corp'n**..... 56  
A division of the Columbus-McKinnon Chain Corp'n. This company has a background of many years of progressive experience in the material handling field. The Chisholm-Moore line is kept continuously up-to-date, and includes hoisting and conveying equipment for every purpose, in a wide range of capacities. Hand and electric power hoists, trolleys and cranes, and overhead track systems adapted to any particular requirement, are built in many models and designs.
- Cleveland Wire Spring Co.**..... 57  
The company was established in 1892 and has been one of the foremost in the successful manufacture and research in the mechanical spring industry. It maintains two plants, one of which consists of some three acres of floor space equipped with every modern facility for spring manufacture. An expert Engineering Department is also maintained wherein you may make your spring trouble theirs. Plant Number Two specializes in Steel Factory equipment consisting of Steel Shop Barrels, Boxes, Shelving, Steel Factory Stools, etc.
- Cleveland Worm & Gear Co.**..... 58  
Organized in 1912—was one of the first companies to manufacture automotive worm gearing in commercial quantities. In 1916 the development of an efficient industrial worm gear drive led to the production of a complete standard line of worm gear speed reduction units which were placed on the market in 1919. Cleveland drives of all sizes have been remarkably successful because they are a combination of sound engineering, accurate workmanship, and intelligent application of the worm gear principle of power transmission. No other type of gearing is manufactured by Cleveland and Cleveland engineers devote their attention to this one product.
- Cochrane Corp'n**..... 59  
Is the continuation and successor of the Harrison Safety Boiler Works, founded in 1863. It designs and manufactures high grade steam specialties, including direct contact and surface feed water heaters, deaerating heaters, hot-process lime-soda and zeolite water softeners, filters, continuous blow down systems, pipe flow meters for steam, water, and air, V-Notch meters, back pressure valves, boiler blow-off valves, pilot actuated water regulating valves, steam and oil separators, steam purifiers, traps, drainers and dischargers, etc. The Cochrane open feed water heater, of which some 20,000,000 boiler horsepower capacity have been sold in the U. S., has been the leader and model of this type of equipment since 1897.
- Combustion Engineering Co. (Inc.)** 60, 61  
The successor company to the Combustion Engineering Corporation and the American Stoker Company, whose history dates back to the early 1890's. The company's present line of equipment includes all types of mechanical stokers, storage and direct-fired pulverized fuel systems, a complete line of water-tube



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boilers, water-cooled furnaces, air preheaters, economizers, ash conveyors, and related products. The company pioneered the development of water-cooled furnaces and air preheaters in this country, in addition to pulverized fuel, and has been a principal contributor to the development of design and equipment which have made possible the supersized steam generating units and higher pressures and temperatures characteristic of modern practice.

Condenser Service & Engrg. Co... 62, 63

Connersville Blower Co. (see Roots-Connersville Blower Corp'n)..... 180

Consolidated Ashcroft Hancock Co. (Inc.)..... 64, 65

This company is an outgrowth of a number of the oldest manufacturers of instruments and steam specialties, dating back to 1850. The present company is the successor to the Ashcroft Mfg. Co., the Consolidated Safety Valve Co., American Steam Gauge and Valve Mfg. Co., the Hancock Inspirator Co., The Hayden & Derby Mfg. Co., the Schaeffer & Budenberg Mfg. Co., and the American Schaeffer & Budenberg Corp'n. Two plants are maintained, one at Bridgeport, and the other at Boston. The Bridgeport plant is used to manufacture Indicating Gages, Safety Valves, Recording Thermometers, Temperature Controllers, Recording Gages, Power Control Valves, Tachometers, Industrial Glass Thermometers, Dial Thermometers, and other instruments. Hancock Valves, H & D Injectors and Ejectors are manufactured in the Boston plant.

Cooling Tower Co. (Inc.)..... 59

An engineering organization which has been engaged since 1911 in the design, manufacture, and erection of all types of water cooling equipment and air washers. Water cooling equipment includes atmospheric cooling towers, mechanical draft towers of the induced and forced draft type, chimney and Bourdon type towers, indoor cooling towers, and spray nozzle cooling systems. Installations have been made throughout the world in connection with refrigeration and air conditioning equipment, steam condensing, oil refining, etc.

Coppus Engineering Corp'n..... 66

Has been manufacturing for the past twenty years specialties in the blower and steam turbine field. It was one of the pioneers in the application of steam turbine driven blowers to provide forced draft for steam boilers. It has been continuously active in the field of mine and industrial ventilation, furnishing both propeller and centrifugal blowers with steam or compressed air turbine as well as electric motor drive. Its steam turbines and turbo generators are also well and favorably known. Its engineers have developed numerous blower specialties including boiler and tank ventilators and exhausters, manhole ventilators, man cooling fans, and forced draft blower combustion control for domestic heating systems. During 1932 it brought out a line of dry type air filters for ventilating and air conditioning systems and for use on air compressors, internal combustion engines, electric motors, etc.

Cramp Brass & Iron Foundries Co.... 67

Originally founded in Philadelphia in 1928 as the main foundry of Levi Morris & Co. It later became the Wm. Cramp & Son Ship and Engine Building Company and has since been purchased by the Baldwin Locomotive Works and is now operating under the name of the Cramp Brass & Iron Foundries Co. at the Baldwin Locomotive Works plant at Eddystone, Pa. In addition to its own developments the company is the sole producer in this country of the famous Parsons' Manganese Bronze and Parsons' White Brass. The largest bronze and iron castings obtainable in the United States are the products of these foundries; the metals being reduced in either oil, coke, or electric furnaces.

Crane Co..... 68, 69

Makers of valves, fittings, piping, and specialties—for steam, oil, air, water, and gas—and of plumbing and heating materials for home, commercial, and institutional use. Pioneers in the study and development of metals and designs for piping materials to control high temperatures and pressures. Founded 79 years ago this company has

grown from a modest beginning to a globe-girdling organization serving every part of the earth with dispatch.

Crosby Steam Gage & Valve Co..... 70

Over sixty years engaged in manufacture of safety and relief valves, indicating and recording gages, engine indicators, steam and air whistles, globe, angle, and check valves, gage testing equipment, etc. One of the more recent Crosby developments is the high capacity nozzle type pop safety and relief valve for high pressures and temperatures. These valves are now considered standard equipment in many of the central stations, manufacturing plants, and in practically all oil refineries.

D

Dart, E. M., Mfg. Co..... 97

This company is generally recognized as the original Ground Joint Union Manufacturer. More than thirty-five years ago, in a village near Providence, the first Dart Union was made. Crude indeed, compared to its present state, but the idea has never altered. That idea was, and is, to have a union with a joint which cannot deteriorate and thread ends which cannot stretch or alter shape. After long experimenting and testing many styles of construction to obtain the best results, patents were secured and the Dart Union placed on the market. Today there are millions of Dart Unions in use and this company is recognized as one of the leaders in its field.

Davis Regulator Co..... 71

Founded by G. M. Davis in 1875, who made one of the first Automatic Pressure Reducing Valves in America; incorporated 1899. George C. Davis, son of the Founder, has devoted his life to the business and has been President since 1908. The company specializes in the design and manufacture of Automatic Pressure and Flow Control Equipment used in public buildings and industrial plants. In 1930 the company moved into their new modern factory building, especially designed and constructed for the efficient manufacture of their product.

Dayton-Dowd Co..... 72

From a modest beginning a quarter of a century ago has grown the present extensive line of Dayton-Dowd centrifugal pumps, in single and multi-stage designs, for virtually every pumping service. Dayton-Dowd builds centrifugal pumps exclusively and is a completely integrated plant, having its own engineering department, pattern shops, iron and brass foundries, machine shops, assembly shops, and one of the most up-to-date hydraulic laboratories in the country. The line comprises centrifugal pumps only, from 3/4" to 60" discharge. No other type of pump occupies their attention or facilities.

Dean Bros. Co..... 74

Began in Rome, N. Y., in 1867; manufactured steam pumps for railroad water stations. They established their shops permanently in 1869 at Indianapolis. In 1879 they patented a direct acting, single style steam pump with noiseless valve movement; in 1885 an improvement on it. In 1882 they built a new plant; in 1893 another, thrice larger. In 1899 they patented their duplex hydraulic pump having forged steel pump cylinders; originated a design for heavy pressures. In 1906, they patented their "Durable" duplex valve movement, with interchangeable levers, which reduced the number of steam cylinder parts.

Dean Hill Pump Co..... 75

The present line of Dean Hill Pumps is the result of nearly half a century of progress in designing and building high grade equipment. Experience gained during that time has enabled its engineers to apply centrifugal pumps to practically every industry. New materials, together with new developments, have opened many new fields of application and now there is a pump for handling any liquid that will flow. The company maintains offices in principal cities, with competent engineers in charge who are glad to assist and advise on pumping problems.

De Laval Steam Turbine Co..... 73

Established in 1903 to manufacture impulse steam turbines, both single-stage and multi-stage, and double helical speed reducing gears for use with high speed steam turbines in driving medium and slow speed machinery. At the same time, improved centrifugal pumps, showing high mechanical efficiency when delivering against high heads and at high speeds, were introduced. The present line of manufacture includes, in addition to steam turbines and pumps, centrifugal blowers and compressors for pressures up to 100 lb. per sq. in. positive displacement rotary pumps, propeller pumps, worm reduction gears, and water turbines.

Detroit Electric Furnace Co..... 71

Brass and Iron foundries in many states and countries use the rocking electric furnaces made by this concern since 1918. Manufacturing organization supplemented by foundry, estimating and metallurgical services. Especially active in brass melting and production of high-strength irons. New designs and active research program make this company a leader in the melting industry.

Detroit Hoist & Machine Co..... 76

In business over 28 years, this company is one of the pioneers in the manufacture of small power hoists. The early years of manufacturing were confined to the Geared Pneumatic type of Hoists, Cranes, etc., many of which are still in successful operation. For over twenty years the line has also included Electric Hoists, Cranes and Overhead Hoisting Appliances, embracing a line of cranes of standard and special design from one to ten tons' capacity. This firm has its product widely distributed and has enjoyed a healthy business experience, never having changed its management or policies.

Detroit Stoker Co..... 77

Established in 1898 and has had thirty-five years of continuous experience in combustion and in the manufacture of stokers; is one of the oldest and has one of the largest and most modern plants devoted exclusively to the manufacture of stokers; started originally with a "V" type inclined grate overfeed stoker. Through constant progressiveness they have designed and are now manufacturing several different types of Underfeed and Overfeed Stokers to meet all conditions of fuel, physical layout of plants and load demands in the heating and power field.

DeWolf Furnace Corp'n..... 78

The DeWolf Furnace Corporation organized in 1928, handles the patented arch and wall construction developed by Roger D. DeWolf, Chief Operating Engineer of the Rochester Gas & Electric Corporation. Applied first in 1920 as an Arch for Cox Stokers working under severe operating conditions. The same basic principles were applied in 1923 to Powdered Fuel Furnaces, then to stoker furnaces developed over a period of eight years to meet the rigorous conditions of utility plant operation, both as straight air cooled and with a minimum amount of bare tube water walls. The DeWolf Steel Supported Refractory Walls, either Air or Water Cooled or Insulated have been successfully applied to many industrial installations, both powdered fuel and stokers, with resultant lowered maintenance costs and customer satisfaction.

Divine Bros. Co..... 79

An organization that for 40 years has specialized in the development and improvement of methods and equipment for finishing metals by means of abrasives. In addition to a plant for the manufacture of polishing machines, polishing wheels and buffs, it maintains an engineering department and laboratory. In these, new processes and equipment are constantly under development to meet the special needs of customers, and to advance the state of the art. Most metal finishing problems require special treatment which the combination of factory, laboratory, and engineering is ideally fitted to develop.

Doehler Die Casting Co..... 80

Organized by H. H. Doehler in 1906 with plants at Brooklyn, N. Y., Batavia, N. Y., Toledo, Ohio, Pottstown, Penna., and Los Angeles, Cal. Are the largest producers of Die Castings in Zinc, Aluminum, Brass, Tin, and Lead Alloys. This company introduced Zinc Alloy Die Castings commercially and have since pioneered Aluminum and Brass Die Castings.



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## E

### Economy Pumping Machinery Co. . . . . 81

Centrifugal Pumps of all kinds. Vacuum and Condensation Pumps for Heating Systems, Sewage Pumps, Sump Pumps, etc. Founded in 1914 by Richard H. Thomas who had become interested in pumps for use in air conditioning apparatus. Immediately afterward he disposed of his air conditioning patents and henceforth devoted his entire time to pumping equipment. The Economy line has been refined and expanded until it is one of the best known specialty pump manufacturers. Unusual facilities have been developed for serving resale manufacturers and others who require pumps for unusual services. An interesting 148 page catalog of Economy products is available upon request.

### Edward Valve & Mfg. Co. (Inc.), The 82

Edward Valves, for a quarter of a century, have been built for high pressures and high temperatures. As pressures and temperatures have increased, new lines have been developed to meet advancing requirements. The company has specialized in feed line stop-check valves, non-return valves, and blow-off valves for boiler service. In addition, an extensive line of globe and angle valves and check valves, forged steel in the smaller sizes and cast steel in the larger sizes, is offered for standard pressures from 300 lb. w.s.p. up. High strength cast iron valves are offered for service up to 250 lb. w.s.p. These valves are largely used in central stations and in refinery, industrial, and technological service.

### Ellison Draft Gage Co. . . . . 83

### Elmes, Charles F., Engrg. Works. . . . . 84

Founded by Carleton D. Elmes in 1851; succeeded by Elmes & Son (Charles F. Elmes) in 1861; incorporated in 1895. The business is still controlled by direct line of descent, viz., Charles W. Elmes, Carleton L. Elmes, and Charles F. Elmes, II. The president and treasurer are two of the original officers of incorporation. The ability of Charles F. Elmes to design and construct highly complicated machinery resulted in the successful building of all kinds of hydraulic equipment. With this invaluable experience, the corporation made rapid progress in important developments of rapid acting hydraulic valves, and specialized press equipment with automatic attachments for inexpensively modernizing old units to cut production costs.

### Everlasting Valve Co. . . . . 84

Founded in 1906 by John H. Allen, Franklin M. Patterson, and Alexander B. Scully; incorporated in 1908 as Patterson-Allen Engineering Company. The main business at the start was the development of P-A Joints and Pipe Flanging Machines for attaching flanges to pipe. The manufacture and sale of the Everlasting Valve was at that time a secondary consideration, but by the beginning of the World War in 1914 the use of Everlasting Valves had grown to such magnitude that the entire shop capacity had to be devoted to making Everlasting Valves. In June, 1917, the name was changed to Everlasting Valve Company. In Canada Everlasting Valves have been continuously manufactured and sold by Everlasting Valve Co., Ltd., Toronto. During 1933 Everlasting Valve Co. (Great Britain), Ltd., was established in London to manufacture Everlasting Valves for allotted foreign markets.

## F

### Fairbanks Co. . . . . 97

Throughout many generations this company has steadfastly maintained its reputation as a manufacturer of quality products. Years of experience in the manufacture and distribution of mechanical specialties contribute to the continued excellence of their product. They operate a modern plant at Binghamton, N. Y., for the manufacture of Valves, both Bronze and Iron, and another at Rome, Ga., for the manufacture of Hand Trucks, Wheelbarrows, Drag Scrapers, and Casters.

### Fairbanks, Morse & Co. . . . . 85

The industrial activity of this company dates back more than a hundred years to 1830. From the beginning, products in keep-

ing with the industrial development of the times have been produced. In addition to scales, the products developed during the 19th century included windmills, steam engines, power transmission equipment, electric generators and motors, steam and centrifugal pumps, producer gas engines, and other internal combustion engines. The activities of the company now consist chiefly of the manufacture and sale of Diesel engines for both marine and stationary service. Electric motors and generators in sizes from 1/8th to 10,000 hp. steam, power, and centrifugal pumps for every pumping requirement and scales in all capacities from 0.0001 of an ounce to 450 tons for weighing giant locomotives.

### Falk Corp'n. . . . . 88

Founded in 1894, pioneered Herringbone Gears in America. They specialize today in Precision Helical Gears of all sizes and are widely known for the manufacture of Reduction Drives for all purposes, Speed Reducers, Motoreducers, Flexible Couplings, and Automatic Centrifugal Clutch Couplings. They also operate one of the largest and best equipped Open Hearth Steel Foundries in America—making castings from one to 150,000 pounds. The Falk Machine shops are equipped to build special machinery to specifications and to handle job work requiring speed and precision.

### Farrel-Birmingham Co. (Inc.) . . . . 86, 87

This combination of two of the oldest and most prominent firms in the Eastern United States, dating back to 1836 and 1848, operates three large plants. The Ansonia and Derby (Connecticut) plants are devoted chiefly to the manufacture of rolls and heavy machinery for five major industries—rubber, plastics, metals, cane sugar, and paper—although heavy machinery for many other uses is also built. The roll shop at Ansonia, where rolls are made for a great variety of purposes, is one of the largest specialty roll manufacturing plants in the world. The output of the Buffalo (New York) plant is principally Farrel-Sykes gears, gear units, gear generating machinery and flexible couplings.

### Fleming Structural Steel Co. . . . . 89

### Flexo Supply Co. . . . . 89

Established in 1922, this company specializes in a flexible or swing pipe joint known as the "FLEXO JOINT." FLEXO JOINTS are in service in countless plants all over the world for use wherever a movable pipe connection is required for conveying steam, compressed air, water, oil and other fluids under high or low pressure. While always considered a leader in its field, the FLEXO JOINT has been constantly improved to keep pace with the most severe industrial requirements—more particularly high steam pressures and temperatures.

### Foot Gear Works (Inc.) . . . . . 90

Founded by Bradford Foot, famed authority on gear manufacturing and speed reducer design, who heads the Company. For more than forty years, Bradford Foot has designed and supervised the manufacture of various types of power transmissions. The Company manufactures all types of gears, worm, spur, herringbone and motorized speed reducers, couplings and various other kinds of drives; maintains a large research and engineering department for the development and solution of customers' transmission problems. The plant is of the most modern type—capable of handling every kind of gear in all sizes and in any quantity from one to a million.

### Ford Chain Block Co. . . . . 91

### Foster Engineering Co. . . . . 92

Established in 1879, fifty-five years ago and during the past half century specializing in the manufacture (one of the pioneers) of automatic valve specialties. Today, their line of over 70 different types provides for a selection to meet most automatic valve requirements and conditions.

### Friez, Julien P., & Sons, (Inc.) . . . . 93

Established in 1876, has been one of the leading American makers of Meteorological and similar instruments for 58 years. The company's products are largely used by U. S. Weather Bureau, Navy and other Government departments and have wide application in water undertakings and many industrial fields. Very fine research laboratories are maintained in Baltimore and more

recently a new range of moderately priced hygrometric instruments for automatic control, indication, and recording in air conditioning work, has been placed on the market. The company became a unit of the Bendix Aviation Corporation group in 1930.

## G

### Garlock Packing Co. . . . . 94

Has been identified since 1887 prominently with the development, manufacture, and sale of high grade mechanical packings and immediately allied products. Garlock materials, sold only under the registered Garlock name, are known in every civilized country. Garlock packings are made complete, from the crude materials to the finished products, in the fully equipped modern Garlock factories at Palmyra. In their production, asbestos, rubber, flax, cotton, many alloys, and metals are used. Constant research and development work are carried on in the Garlock laboratories where, also, are solved the many packing problems of providing special packing materials for difficult or unusual applications.

### Gas Pump & Burner Mfg. Co. . . . . 95

Organized in 1915, to manufacture pumps especially suited to oil field and oil pipe line service. The original executives of the company, T. J. Flanagan, M. J. Flanagan, and L. D. Armstrong, continue in charge of the company's operations today. The company manufactures a line of small field pumps for rodline, piston power, and walking beam drive; and a complete line of larger pumps for oil and water service in connection with both lease and pipe line operations. All are characterized by sturdy design, few parts, and rugged construction generally. The company has as customers practically all of the leading oil producing and refining companies in the United States, as well as many in foreign countries. More than 17,000 Gas Pumps have been sold, and many of the first ones sold are still in daily use.

### Gates Rubber Co. . . . . 96

This organization, because of its unusual research and development facilities, is one of the leaders in the field of V-Belt Drives. 1-50 h.p., 2-15 h.p., and 2-5h.p. Dynamometers are used exclusively for testing single and multiple V-Belt Drives for efficiency, h.p. rating, and life under varying conditions. A Laboratory staff of four experienced engineers is engaged exclusively in testing, designing new drives and developing data for industry. A workshop for everyday observation and study of actual drives is afforded by the Gates plant itself, where 326 separate drives, ranging from 1/4 h.p. to 200 h.p. and with belt speeds varying from 100 ft. to 6,000 ft. per minute, are in daily operation. This company has pioneered a great many new V-Belt Drive applications. Among these are the V-Flat Drive and the Quarter-Turn Drive.

### General Electric Co. . . . . 98, 99, 100, 101

Forty-two years ago the Thomson-Houston Electric Co. of Lynn and Boston consolidated with the Edison General Electric Co. of New York and Schenectady, forming the present General Electric Co. At that time the company had three modest manufacturing plants. Today it has seven large apparatus works and ten incandescent lamp factories. Having to its credit the improvement of the incandescent electric lamp, the introduction of the Curtis steam turbine as a primary power unit for electric generating stations, the evolution of the modern electronic tube, the establishment of a renowned scientific research laboratory, the development of air conditioning systems, General Electric today is one of America's leading electrical manufacturers.

### Glover Machine Works. . . . . 91

Has, for more than thirty years, manufactured a complete line of industrial steam locomotives and special machinery for domestic and foreign service. It likewise has the distinction of being one of the oldest manufacturers of high pressure cast steel pipe fittings; as it has, since 1918, manufactured a complete line of regular and special cast steel pipe fittings, both flanged and screwed made of carbon and alloy steels produced by the basic electric process. Its subsidiary plant, namely, Glover Steel Company, Cordele, Georgia, was established in 1933 to produce the same high class material according to the most rigid specifications. Both plants are quite modern, and maintain complete pat-



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tern shops, foundries, heat treating departments, machine shops, testing and inspecting departments, laboratories, and engineering departments.

## Goetze Gasket & Packing Co. (Inc.) 103

This company has originated many of the accepted standard types of metallic gaskets, has since 1887 concentrated upon problems involving fluid and pressure tightness, and specializes in custom work involving intricate shapes and absolute and lasting tightness under previously baffling conditions. Its facilities include an able engineering staff, long research, fabricating and testing experience, highly skilled operatives, and excellent plant and equipment.

## Goulds Pumps (Inc.) 102

Iron pumps were made in Seneca Falls as early as 1844. From this beginning grew the "Goulds" pump industry of today, in a plant that covers more than 80 acres, and which produces pumps to handle every liquid that flows. Outstanding in the company's growth has been its development work, its constant efforts to improve its products and keep them thoroughly up to date in design and performance.

## Granger Machinery Corp'n. 106

This company was established in 1893 and incorporated in 1900. A firm of contracting engineers, specializing in power plant machinery, including boilers, engines, electric generators, feed water heaters, pumps, steam turbines, cranes, chimneys, breechings, etc., including complete installations with piping and all accessories. Also oil conversion installations, including the oil storage, pumping, and heating units, as well as the remodeling of furnaces. The company represents several old established builders, including the Murray Iron Works of Burlington, Iowa, and also handles the Oswego internally fired water tube boiler exclusively.

## Grant Gear Works. 103

Founded in 1877 by George B. Grant, "the pioneer Gear man," to manufacture better Gears. The business developed so that in a few years the first stock Gear catalog in this country was issued. Today this catalog has 150 pages and contains Gears, Sprockets, Reduction Units, etc., and many useful and interesting tables on horse power, etc.

## Gwilliam Co. 104, 105

Incorporated in 1912, by George T. Gwilliam, a pioneer in the Bearing Industry, who early recognized the need for a source of supply for "Hard to Get" and obsolete sizes and unusual types of bearings. Specializing in the design of these and with a set-up that permitted the production of various types and sizes of anti-friction bearings in quantities of "one to one thousand" and backed by careful engineering, the plan proved a success. Today many "standard" types and sizes of bearings are now produced and carried on hand for immediate delivery besides a large stock of "Specials." A similar line is carried in the Philadelphia office.

H

## Hardinge Co. (Inc.) 107

Has been manufacturing mining and industrial machinery for approximately twenty years. The business was founded upon the Hardinge Conical Mill for grinding ores. Since that time, the mill has been adapted by means of air classification and other auxiliaries to grind coal, cement, and other materials. In 1920 this company acquired a plant in York, Pa., where the main office is now located, and at the same time acquired the Ruggles-Coles Dryer which is probably the best known type of rotary dryer in existence. About 1925 the company began manufacturing equipment for sewage treatment plants with very successful results. With these various lines of machinery, the company has expanded to many times that of the original company.

## Harnischfeger Corp'n. 108

Originally founded in 1884 as Pawling & Harnischfeger, the Company is this year

celebrating its fiftieth year of business with management having passed into the hands of the second generation. As one of the largest and most important manufacturers of excavating and industrial equipment, the Company pioneered in the development of many lines and was, in fact, the first to build the tri-motored electric traveling crane. Among its industrial products are traveling cranes, electric hoists, electric motors, arc welders, motor generator sets, lighting plants, barrel coating machines for breweries, etc. The line of contractor's equipment includes power shovels, draglines, cranes, trenchers, tunneling machines, etc., with a complete line of accessories. The parent Company, located at Milwaukee, maintains offices at 18 important centers throughout the United States.

## Hauck Mfg. Co. 109

Have manufactured oil burners and oil burning equipment for the past 33 years. Among the more prominent products are the Venturi high and low pressure air atomizing oil burners for heating and heat treating furnaces; the micro-vernier oil regulating valves for any oil burner; and recently have added a line of gas burners suitable for all kinds of gases including butane, propane, and petroleum gases. It maintains an Engineering Department to meet the special needs of customers.

## Hauser-Stander Tank Co. 110

This company is one of the oldest and largest manufacturers of wooden tanks, having been in existence more than sixty years. Early in its career an admirable reputation for quality was established, and as the business has grown in years and size, this enviable reputation has been maintained. Its products have gone into every kind of industry with uniformly gratifying results. This success is attributed to the skill and experience of the organization, which assures the selection of the proper materials for each particular use and the working of same, in their modern factory, into finished products of quality.

## Hays Corp'n. 111

Manufacturers of a complete line of Combustion Instruments, was founded by Joseph W. Hays, who designed a flue gas Analyzer which was rugged, compact, and accurate, using this first instrument in his own work. From a small manufacturing business which was started as a side line, this business gradually expanded as other combustion instruments such as Automatic CO<sub>2</sub> Recorders, Draft Gages, and complete Portable Combustion Test Sets, were added to the "Hays Line."

## Hayward Co. 112

Founded in March, 1897. One of the pioneers in the development of the grab bucket, both for digging and rehandling applications, it has perfected a line of equipment that includes every type of bucket for every service. Among the more popular Haywards are the Orange Peel Bucket in Standard, Heavy and Multi-Power designs, also the Three Bladed Orange Peel for handling rock, and the Dwarf Buckets and Mid-get Digging Machines; the Class "E" Clam Shell, better known as the Hayward Re-handling Bucket, the Class "K," which is The Hayward Digging Clam Shell Bucket; the Electric Motor Clam Shell Bucket for overhead crane service, and the Drag Line Bucket. The Hayward Line also includes Dredges, Traveling Derricks and Coal Handling Machinery, Cable Take-up-Reels and Counterweight Drums

## Hazard Wire Rope Co. 106

## Homestead Valve Mfg. Co. 113

Founded more than forty years ago, this company originated the now famous Homestead line of Quarter Turn Valves. These plug type valves and their various modifications such as the lubricated and Round Port Valves have since established enviable records in hundreds of industrial and process plants for long, continuous service at negligible maintenance cost. Among other Homestead products are Hovalco Blow-off Valves, Homestead Protected Seat Hydraulic Operating Valves, Spray Valves, Homestead Lift Type Plug Valves; Air Shut-off Valves and the Hypressure Jenny, industrial automotive and building cleaning machine.

## Hunt, Rodney, Machine Co. 114

Since 1840 engaged in the manufacture of Water Wheels, and accessory equipment that together make up a complete Water Power Plant. This has led to the development of many efficient designs, culminating in the modern "Hi-Test" Water Wheels, which in official Holyoke Test have shown a top record, 93.38% efficiency. Furthermore, these many years of experience have led to the design and manufacture of a complete line of "Testite" Sluice Gates, "Tri-Seal" Gate Hoists, etc., with an "Extra Factory of Safety." Today these Gates and Hoists are widely used throughout the U. S. for Water Works, Sewerage and Irrigation Plants, etc.

## Industrial Brownhoist Corp'n. 114

The oldest and largest makers of locomotive cranes in this country and builders of the most complete line of this equipment; also the inventors of the heavy dock machinery now in universal use for unloading bulk cargoes from vessels. The corporation was formed several years ago by a consolidation of the Industrial Works (founded at Bay City, Michigan, in 1873) and of The Brown Hoisting Machinery Co. (founded at Cleveland in 1880). General offices are located at Bay City, Michigan, and the company now manufactures a wide line of material handling machinery.

## Ingersoll-Rand Co. 115

Is a consolidation of firms that have held leading positions in the manufacture of rock drills, air compressors, pumps, engines, and allied equipment for more than 60 years. The list of products has grown to more than a score of different types of machines and these are now used by hundreds of lines of industry in practically every part of the civilized world. They are made in three factories in the United States. Associated companies have manufacturing facilities in Canada and abroad. The company maintains more than 30 branch sales offices which are located in every important mining or industrial country. The home office is located at 11 Broadway, New York, N. Y.

## International Nickel Co. (Inc.) 116

Is a subsidiary of the International Nickel Co. of Canada, Ltd. From Canadian mines and its refinery and rolling mills at Huntington, West Va., come Monel Metal (an alloy containing approximately two-thirds nickel and one-third copper) and pure Nickel in all commercial forms including sheet, strip, seamless tubing, bar, rod, wire, angles, and special shapes. It maintains an extensive technical service department to aid users and potential users of its products. Products of the company are carried in stock in convenient warehouses located in all sections of the world.

J

## James, D. O., Mfg. Co. 117

This company was established in 1888 manufacturing Gears and Special Machinery and is at the present time producing Gears, Speed Reducers, and Couplings of various types. Planetary Speed Reducers were originated by this company in 1904 and have been used extensively ever since. Besides making all the various type speed Reducers, a new motorized Herringbone Reducer has been fully developed recently.

## Jarecki Mfg. Co. 118

Since 1852 Jarecki Valves and Pipe Fittings have been developed to their present standard. Backed by thorough knowledge and long experience Jarecki products deserve their reputation. The main plant built during the late war, and at that time employing 7200 men manufacturing shells and howitzers, covers over 9 1/2 acres of floor space. In this plant are located Malleable, Cast Iron, and Brass Foundries, and the machine shops where Jarecki Valves, Fittings, Pipe Threading Machines, Compressor Governors, and Unloaders, Oil Well Supplies, etc., are finished.



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## Jeffrey Mfg. Co. .... 120, 121

Founded by J. A. Jeffrey in 1877 and was originally devoted to the manufacture of coal cutting machines. However, during the last half century, it has broadened its product until, in addition to coal cutting machines, electric locomotives, ventilating fans, tippie machinery, and other equipment for coal mines, it produces a complete line of material handling machinery. Today Jeffrey is one of the largest manufacturers of material handling and mining equipment in the world. The present plant covers more than 60 acres of ground.

## Jenkins Bros. .... 122, 123

For seventy years Jenkins Bros. has specialized in the manufacture of fine valves. From the original Jenkins Valve with the renewable disc feature which was invented by Nathaniel Jenkins, the line has grown to over 400 different valves, covering practically all engineering, industrial and plumbing and heating needs. Two modern plants are operated. The Bridgeport, Conn., plant producing not only bronze, iron and steel valves, but also the widely known line of Jenkins Mechanical Rubber Goods. The Lachine, Canada (Jenkins Bros., Limited), plant is devoted entirely to the manufacture of valves.

## Johns-Manville. .... 124, 125, 126

The world-wide activity of this corporation includes the manufacture of products from asbestos, magnesia, diatomaceous silica, rock wool, and asphalt. This business was initiated 76 years ago by H. W. Johns in a one-room establishment at 78 William Street, New York City. The Johns organization was joined to the Manville Covering Company in 1901 and to the asbestos Wood Company in 1907. The Celite Company was added in 1928 and subsequently the Banner Rock Products Company and Weaver-Henry Mfg. Company. Incidental mergers with other smaller companies have taken place at various times and mines have been developed and factories built in many parts of the world, so that now the well-known products of this company are readily obtainable anywhere.

## Johnston & Jennings Co. .... 119

An engineering firm operating successfully for 48 years. Its six acre plant includes a machine shop, forge shop, and iron foundry specializing in high tensile semi-steel castings up to 40 tons, also a complete physical testing laboratory. Special machinery is designed and built to order. All departments accept jobbing work. Manufactured products include US Molding Machines and Stowe Stokers for industrial and central station plants. The stoker is neither an underfeed nor conventional chain grate. Its patented "Compensated Feed" produces a fire bed of uniform thickness and blast resistance providing unusual efficiency with both eastern and western coals.

K

## Keeler, E., Co. .... 128, 129

Keeler Boilers are offered to steam users as the product of seventy years' experience in building boilers. The Keeler shops have been in continual operation building boilers since established in 1864. Keeler has the experience, proven workmanship, design, the tools and machinery required to produce a boiler that is efficient and reliable. All Keeler Boilers are built in strict conformity with the A.S.M.E. Code or State Code.

## Kellogg, M. W., Co. .... 127

Established by the President, M. W. Kellogg, early in the present century. The business at first consisted of general contracting. Later the fabrication and erection of industrial piping systems became a major part of the business. About 1914, a plant was erected in New Jersey for the fabrication of pressure vessels of various types. In 1918 the company began to specialize in equipment for the petroleum industry. At present, the design and erection of cracking plants forms an important part of the business. Kellogg pressure vessels are fabricated by the "Masterweld" process, a method of coated electrode fusion welding developed and perfected by engineers of this organization.

## Kennedy-Van Saun Mfg. & Eng. Corp'n. .... 130

The Kennedy line of mining, crushing, cement, elevating, conveying, and screening equipment, pulverized fuel equipment for power plants, pneumatic transport systems, air cooled and shadow water walls is the result of 46 years of experience in the reduction of materials. They specialize in furnishing complete plants.

## Kieley & Mueller (Inc.) .... 131

Since 1879, this company has designed and manufactured engineering specialties for pressure and level control. Many of the world's famous buildings and the largest industrial plants are K. & M. equipped. Simplicity of design and operation are outstanding features of K. & M. products. Factory at Newark, N. J.; General Offices and Warehouse in New York City; branches or representatives in all principal cities. Complete engineering department to co-operate with prospective users of K. & M. equipment.

## Kingsbury Machine Works (Inc.) ... 132

The principle of tapering oil films was first applied in this country to thrust bearings by Albert Kingsbury. One of the earliest commercial installations was made in 1912 in a hydro-electric unit at the Holtwood Station of the Pennsylvania Water & Power Co., on the Susquehanna River. The marked success of this bearing led to the adoption of Kingsbury Bearings for all ten units at that plant and to the rapid acceptance of Kingsbury Bearings among hydro-electric engineers. In similar manner the use of Kingsbury Bearings spread through the steam turbine field and then through the marine field; and they are now recognized as standard for those and similar duties. They are now available for heavy duty in all classes of machines.

## Kirk & Blum Mfg. Co., The. .... 133

This engineering organization designs, fabricates, and installs (1) Suction and Blower Systems of any size and for every purpose including the collecting of shavings and sawdust; buffing, polishing, grinding, cooling and air conditioning for factories, stores, shops, theatres and buildings; sand-blast and foundry dust; grain elevator and mill dust; shoe factory refuse and textile lint. (2) Cooling systems for glass plants; heat reclamation and drying systems for ceramic plants. (3) Paint spray, fume and heat removal. (4) Ventilating and air-conditioning. (5) Industrial ovens. Also manufacturers of sheet metal parts and stampings such as: pressed steel commercial body and truck cab parts; one piece elbows and stream-line fittings; pickling baskets and crates; lead lined steel tanks and fume exhaust systems.

## Kraissl Co. (Inc.) .... 134

This business was founded in April, 1926, by Frederick Kraissl, Jr., as an engineering concern to represent manufacturers of allied engineering equipment. Particular emphasis was given to pumping machinery and the representation of the American Machine & Foundry Co. When this firm decided to withdraw from the pump industry, the Kraissl Company took over their patent rights and entered the manufacturing field. The particular mission of this business has been the searching out and solution of pump problems in specialized quantity markets. The basic theory has been that no one displacing mechanism will meet all requirements and the method of approach has been to employ the right design for each type of service. This has led to the development of a number of new pumps, some of which have become sufficiently widely used to become standardized.

L

## Laclede Stoker Co. .... 131

Pioneer builders of chain grate stokers, having experience in this field extending over thirty years. A capable engineering department is maintained for designing each installation to meet its particular requirements. Its plant consists of a large foundry producing grey iron, white iron and semi-steel castings for jobbing work as well as for stokers. It has ample machine shop facilities for fabricating the stokers and for doing a variety of general work.

## Lincoln Electric Co. .... 135

Is the largest manufacturer of arc welding equipment in the world. Pioneering in this field the company produced the first variable voltage arc welder, the first automatic arc welder and first inaugurated the shielded arc process of welding. The company engineers redesigned the first casting to be rebuilt of welded construction; were the first to adopt welding to the structural field, to the design of motors, pipe lines, and bridges.

## Link Belt Company. .... 136

William D. Ewart invented in 1873 the Ewart Detachable Chain, which became the practical foundation of the modern elevating, conveying and power transmission industry; in which the Link-Belt Company has been the foremost manufacturer ever since. With seven principal manufacturing plants in the United States and Canada, besides warehouses and machine shop equipment at strategic locations, and sales offices in principal cities, the Company is serving promptly and efficiently a widespread territory. Its lines of manufacture include 115 of the headings shown in the Index to Manufacturers of the Mechanical Catalog.

## Loneragan, J. E., Co. .... 137

The power engineering field has been served by this company for more than sixty years. In 1872, after his invention of the automatic oilers, which replaced the old hand oil can, Mr. John E. Loneragan established the firm called J. E. Loneragan and Company. From time to time, additional lines were taken over and improved upon, including the Lynde Patent pop safety valve, relief valves, pressure indicating gauges, water gauges and cocks, steam and air whistles, and a full line of lubricators, and other power specialties, all of which are considered standard equipment by the leading engineers. The company was incorporated in 1909 under the name of J. E. Loneragan Company with agencies in principal cities.

M

## McIntosh & Seymour Corp'n. .... 138

The engine building record of McIntosh & Seymour dates back to 1886 when the Company was formed. Until the early years of the present century, steam engines comprised the single line of manufacture. More than 1800 of these were built and put in service and their performance records established McIntosh & Seymour as leading quality engine builders. Advances made in the development of Diesel oil engines in Europe impressed officials of the company to the extent that in 1912 they conducted a comprehensive world-wide investigation of Diesel power. This resulted in the conviction that, the oil engine would attain a commanding position among prime movers. Accordingly, the step was taken to further this development by devoting the engineering personnel and manufacturing facilities of McIntosh & Seymour exclusively to the development, manufacture and sale of American Diesel engines.

## McMahon & Co. .... 140

## McNeill, T. W., Engrg. Equipment Co. .... 139

Formerly known as the Boiler Room Improvement Company, have been manufacturers of boiler room economy devices since 1911 and are pioneers in the art of indicating proper combustion by observation of the color of the uptake gases. Smoke indicating equipment is now standard in all leading steam generating plants burning bituminous coal or oil and has recently been listed as standard equipment by the U. S. Navy and is also in use on many vessels of the merchant marine. They are manufacturers of the Eclipse Smoke & Combustion Indicator. Added to their list of engineering achievements recently, is their remote water level indicator, which brings the boiler water column down to the eye level of the operator, regardless of the height of the boiler or the operating pressure.

## Magnetic Mfg. Co. .... 139

Established by engineers of more than thirty years' experience in designing and building magnets of all kinds exclusively;



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this company has grown to the position of one of the leaders in the industry and can be of service wherever magnetic equipment is useful or beneficial; especially qualified on magnetic separation and transmission problems, maintaining what is considered one of the largest and most up-to-date laboratories for experimentation in the industry. Numerous patented devices are manufactured and built, all resulting from the extensive development and research work conducted by this organization; particularly qualified on DC electrical apparatus, although in position to supply some forms or types of equipment for operation on AC electrical current as well.

## Mears-Kane-Ofeldt (Inc.)..... 141

This company is one of the pioneer manufacturers of gas-fired steam boilers for process work. Since 1904 when William Kane built the first automatically controlled gas-steam boilers to bear his name, Kane boilers have been constantly improved and are still one of the leaders in their field. A companion boiler, the Ofeldt, is one of the fastest steaming boilers made. Agents in several large cities and local gas companies give wide distribution.

## Medart Co..... 142

Nationally recognized as one of the foremost manufacturers of Power Transmission Machinery of all kinds. Established 1879 as the Medart Patent Pulley Co. The shops and foundry now occupy five city blocks in the City of St. Louis, Mo. This company also manufactures turned and polished shafting. Shaft Turning and Polishing Machinery in use in the majority of cold finishing steel mills in the country today has been built by this company. The St. Louis Shafting Mill of this company is one of the oldest in the United States. The products also include special machinery, alloy iron castings, and other specially engineered products for oil, textile, paper, chemical, and other industries. The first steel rim, steel arm pulleys made in the United States were made by this company.

## Monarch Mfg. Works (Inc.)..... 143

Established November, 1916 (not incorporated); incorporated January, 1918, for the manufacture of spray nozzles, valves and strainers.

## Moore Steam Turbine Corp'n..... 144

Manufacturers of Steam Turbines and Reduction Gears since 1916. Makes both single stage and multi-stage turbines of all types up to about 3000 horsepower, with a line of reduction gears for use when necessary to adopt turbines of economical speeds to the correct speed for the driven machines. Special attention is paid to turbines which require consideration of both power and process steam requirements, such as bleeder, mixed-pressure, mixed-pressure-bleeder, high back pressure turbines, etc. A flexible design and manufacturing system is combined with a policy of giving skilled and painstaking engineering attention to each individual turbine. Exceptional testing facilities are available and every turbine large and small is thoroughly tested under load before shipment.

## Morris Machine Works..... 141

The originator and oldest American Manufacturer of centrifugal pumps. Since its establishment in 1864, this concern has specialized in building pumps for difficult services such as handling abrasive, corrosive and pulpy mixtures, as well as clear water. This unequalled experience has developed a number of distinctive Morris features of design which have proven to promote exceptional efficiency and reliability in innumerable installations. Morris Centrifugal Pumps are widely used in industrial plants, municipal water supply and sewage disposal plants, central power generating stations, on shipboard, and throughout the special process industries such as chemicals, pulp and paper, cement, sand and gravel, petroleum refining, coal and metal mining, etc. Morris Hydraulic Dredges have also made outstanding performance records on industrial and municipal services.

## Murray, A. B., Co. (Inc.)..... 145

This firm was founded in 1845 by James H. Holdane and later operated for many years by D. F. Cooney. It is the oldest distributor of Boiler Tubes and Boiler Makers' supplies in the Metropolitan District of New

York and has furnished tubes and steel for many famous ships dating back to the material furnished the MONITOR during the Civil War. The business is operated from a modern and well equipped warehouse, centrally located on the Brooklyn Waterfront for the efficient and prompt distribution of boiler tubes and kindred iron and steel products.

## Murray Iron Works Company..... 145

This company was incorporated in 1870 and has been for 64 years engaged in operating foundries, machine shops, and boiler shops. These plants are situated in Burlington and West Burlington, Iowa, with efficient switching service between and numerous railway sidings. The products of the machine shops are steam engines, steam turbines, unit heaters and auxiliary machinery. In the boiler shops are built boilers of all types and sizes. The equipment of the foundries and shops is designed for both light and heavy machinery and complete power plants are built and shipped at the same time. An extensive engineering organization is maintained.

## N

## Nash Engineering Co..... 146, 147

Established in 1905, this engineering organization has, so far, devoted its energies entirely to the perfection and manufacture of improved pumping machinery for handling air, other gases, and liquids. This company started as a manufacturer of the new well-known Nash Hytor, or Hydro-turbine Air Compressors and Vacuum Pumps. The line has been extended whenever a really superior design could be offered to the market. It now includes the Jennings Return Line Heating Pumps, Condensation Pumps, Sump and Sewage Pumps, Sewage Ejectors, and Centrifugal Pumps.

## National Airoil Burner Co..... 148

This business was established in 1912 and incorporated in 1917 by the present principal officers of the Company and has always continued in their ownership and under their personal management. The manufactured product consists of industrial oil burners and industrial gas burners of various types for every industrial purpose, together with fuel oil handling equipment and oil and gas burning furnaces and furnace equipment. In addition to the manufacture of this equipment, we maintain engineering and contracting departments for consultation regarding proper equipment for specific purposes and for complete installation and erection when desired.

## National Meter Co..... 224

Established in 1870, is one of the pioneers in the manufacture of meters for all kinds of liquids. The "Empire" Oscillating Piston Meter, so generally recognized today as the standard positive displacement instrument for measuring liquids, was originated by this company in 1884. Wherever liquids are bought, sold, handled, or stored, this company is prepared to supply meters suitable for every measuring process involved, all of the highest quality, and backed by the experience and reputation of sixty-four years.

## Neptune Meter Co..... 149

Is one of the largest manufacturers of liquid meters in the world, having made and in service over six million measuring devices to handle almost every known liquid. Special designs to meet varying conditions are furnished, and automatic registering devices for measuring oil, gasoline, water, and almost all liquids can be supplied. Service is maintained through Branch Offices and foreign factories. A staff of engineers is available at all times for solving any liquid measurement problem.

## Newark Wire Cloth Co..... 152

This Company grew from a humble beginning. It was founded by men skilled in the manufacture of wire cloth who had been trained by predecessors whose entire lives were devoted to this trade. Equipment, when their first factory was ready to operate, consisted of three old-fashioned hand looms. Today their plant is equipped throughout

with the most modern machinery. Their facilities enable them to manufacture, with the most exacting accuracy in wire diameter, weave and spacing, wire cloth of all sizes ranging from the coarse heavy grades to 400 mesh, the finest wire cloth woven. Wire used in weaving the finer mesh cloths is all drawn and annealed in their own plant. In 1923 they purchased the Morse & Whyte Company of Cambridge, Mass., an old established wire cloth manufacturer. During the same year erected a new plant large enough to house under one roof the entire equipment of the united companies.

## New Departure Mfg. Co..... 150, 151

Any American who ever straddled a bicycle has a good word for New Departure Coaster Brakes. It has been a standard, dependable article since 1899. Eight years later New Departure engineers first sensed the approaching era of motor cars and the necessity for anti-friction devices. Production started in 1907 and this division has seen a phenomenal growth because every industry soon became ball bearing minded. So extensive are New Departure's present facilities that 125,000 quality ball bearings is the present daily plant capacity. Your bearing problems get expert attention here.

## Newport News Shipbuilding & Dry Dock Co..... 153

Was incorporated in 1890, and has been in continuous operation, engaged in general shipbuilding and ship repairing; marine boiler, engine, and turbine building. The scope of contracts executed and on order covers all sizes of merchant and Naval ships. In 1922 the building of hydraulic turbines and accessory equipment, including head gates, crest gates, penstocks, butterfly valves, rack rakes, etc., was added as a permanent part of the business, and installations of largest sizes and capacities have been made. A large hydraulic laboratory completed in 1933 replaces the original testing flume and includes complete facilities for testing and research. A large and experienced designing staff and modern shops with ample equipment for handling the largest work assure successful products of high quality.

## Norma-Hoffmann Bearings Corp'n. 154

Established in 1911 as the Norma Company of America, this company has from the beginning concentrated upon the manufacture of "Precision" bearings distinguished by high speed-ability, load-ability and service-ability. The present factory at Stamford, Conn., is the third in a series of plants of ever-increasing capacity, made necessary by the demand for these "Precision" units. Equipped with every modern facility for precision production, supplemented by complete engineering and research staffs, its output includes "Precision" Ball, Roller, and Thrust Bearings in a complete range of types and sizes. A number of new types were added to the line in the past year.

## Northern Equipment Co..... 155

Manufacturers of the "Copes" System of Boiler Feed Control and allied products. Has specialized in feed water regulation under present management since 1913. Pioneered the continuous-feed-stabilized-water-level principle of boiler feeding, differential pressure control, the use of feed water regulators for pressures greater than 1000 pounds and other important contributions to modern boiler feed control. World-wide experience and a well-trained engineering staff have made the "Copes" Regulator the recognized standard for performance. In recent years, a complete line of liquid level controllers and flow and pressure controllers has been developed around the accurately balanced "Copes" Control Valve.

## Norwalk Co. (Inc.)..... 156

Pioneers in the building and perfecting of air and gas compressors, Norwalk patented the first multi-stage compressor in 1880. Ever since, the continual development and improvement of Norwalk designs and construction to include every modern feature has produced compressors second to none. Recent years have accounted for the discovery of many new chemical and industrial processes, requiring multi-stage high pressure air and gas compressors. To meet the new demands, Norwalk has built complete lines, which include the utmost in simplicity and accessibility.



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## Ohio Grease Co..... 157

More than a quarter century ago this company introduced a successful grease for steam cylinder lubrication and are today recognized by many engine builders and operators as foremost in the field. They also manufacture a variety of high grade industrial and automotive lubricants.

## P

## Page, Frederick, Contracting Co. 158, 159

Established in 1903 by Frederick Page; incorporated 1909 under the above firm name. Specializes in the installation of complete boiler plants, boiler settings, baffle walls, oil burning, and stoker installations, furnace repairs and incinerators. Its activities are nation-wide. Its engineering and drafting departments are at the disposal of architects and engineers in assisting them on problems of combustion, furnace, and incinerator design.

## Palmer Co..... 152

Since 1872 Palmer thermometers have been made to be very accurate and high-grade. Care has been taken to improve these Industrial Thermometers in every way possible. In 1930 the latest new feature "Red-Reading-Mercury" was developed and offered to the trade. Mercury Thermometers were always hard to read, but now that the pure mercury tubes can be made to show a bright red in the reading column, there is nothing that could be finer. Thermometers include also laboratory style, factory wall-type, hygrometers, and also types for special purposes.

## Pangborn Corp'n..... 160

Many of the outstanding improvements made in Blast Cleaning and Dust Collecting Equipment during the past thirty years may be traced to the tireless energy of Thomas W. Pangborn. In 1904 he founded the above company, and with the able assistance of his brother John C. Pangborn, has so improved and perfected ferrous and non-ferrous foundry practice, and so advanced the engineering principles of dust collection, that today the Pangborn Corporation is universally recognized as the world's largest manufacturer of Blast Cleaning and Dust Collecting Equipment. Branch offices in all principal cities.

## Parker Appliance Co..... 161

An engineering and producing company owned and managed by A. L. Parker. Since 1924 the enterprise has developed into one of national scope servicing nearly every industry including power plant, aircraft, marine, railway, diesel, and steam engine, machine tool, and innumerable other industries. Through extensive engineering and laboratory facilities, new products have been consistently added to the Parker Line so that a most imposing inventory of tube couplings, fittings, and valves in brass, bronze, monel metal, duralumin, steel, stainless steel, and other alloys is available at all times to service industry.

## Pennsylvania Flexible Metallic Tubing Co..... 162

In the field of mechanical engineering the trade name "Penflex" has long been accepted as marking high pressure bronze and steel hose of uniform quality and absolute dependability. The company maintains an engineering department always ready to suggest the type of flexible metallic hose or tubing best suited to meet a specified requirement. In addition "Penflex" sales offices with experienced sales engineers in charge are located in a number of cities to assure national service.

## Pennsylvania Pump & Compressor Co..... 163

Has continuously maintained reputation for highest standards of design and construction. In air compressors and vacuum pumps, air cushioned valves and improved methods of control and regulation are outstanding features. In centrifugal pumps, thrust troubles virtually eliminated through opposed impellers and differential diameters of stage bushing, in multi-stage types; and by balancing port connecting two suction chambers at impeller inlet, in single stage

types. Recent additions to products have been steam booster compressors and close coupled Penn-Motor Pumps, designed to meet varied fields of application.

## Permutit Co..... 164

About 20 years ago this company originated the zeolite method of water softening. Today, its products cover the broad field of industrial and household water treatment. Through a greatly diversified line of equipment, water can be practically tailor-made for any desired use. Because of an exhaustive record of water conditions, and broad specialized experience in the treatment of water for almost every conceivable use, the Permutit organization has become dominant in its field as a specialist in water treating equipment. Permutit installations are in many lands, and range from equipment to handle millions of gallons daily to the modest requirements of a small home.

## Philadelphia Gear Works..... 165

Has manufactured Gears for nearly a half century, and was one of the pioneers in the design and construction of Speed Reducing Units for industrial purposes. Their recently constructed plant at Erie Avenue and G Street, Philadelphia, is one of the most modernly designed and equipped Gear Plants. This company's latest contribution to industry is the "Motoreducer," a unified, self-contained, compact, efficient combination of Electric Motor and Speed Reducer. This device requires no base plate or flexible couplings, etc. The Company also makes the well known Limitorque Motor Valve Operator.

## Poole Foundry & Machine Co..... 166

The present company is the successor company of Poole and Hunt, Robert Poole and Son Company and the Poole Engineering and Machine Company. This organization has specialized in the development and improvements of machine moulded and cast tooth gears, having over 16,000 patterns, ranging in size from 3" in diameter to 20' in diameter. This company is also actively engaged in the manufacture of the Poole patented, flexible couplings and the Poole speed reducers. Throughout the entire business existence of this company and its predecessor companies, its products have been recognized and accepted as the outstanding products in their respective lines. Service, quality and workmanship have enabled this company to maintain its prestige and leadership in its field.

## Powers Regulator Co..... 167

Established in 1891 by William Penn Powers, succeeded by his sons, Fred W. Powers and Donald J. Powers, who are now actively engaged in the firm's management. The company has long been recognized as one of the leading manufacturers of control apparatus for regulating heating, ventilating, and air conditioning equipment. It is also widely known for its comprehensive line of regulators used to control industrial processes and the automatic mixing of hot and cold water. In addition to these products it also manufactures dial indicating thermometers, steam traps, pressure reducing valves, etc.

## Pressed Steel Tank Co..... 168

Are one of the oldest and largest designers and manufacturers of metal containers, for liquids, gases, and solids. For 30 years the trade name "Hackney" has represented metal shapes built only to the highest quality standards. Through the wide experience of this company in serving most of the country's leading industries, many special shapes have been developed, and use made of many different metals in addition to steel. The cold drawing process results in a smooth, seamless construction. The Heat Treating process is an assurance of elimination of all stresses in the metal.

## Proctor & Schwartz (Inc.)..... 169

Established in 1883. Has built Proctor Dryers for industries continuously since that time, although from the date of founding until the year 1920, this organization was known as the Philadelphia Textile Machinery Company—an obvious misnomer remedied by the change of name only after Proctor Dryers had long since extended their service to many other fields than the textile industry originally served. Modern types supply efficient continuous systems for many materials formerly handled only on trays or racks. Modern construction feature super-insulated housings, direct-connected motor fan drives, dynamically balanced fans, improved heaters and conveyors and many other evidences of ad-

vanced skill in dryer-building. Research laboratories under expert supervision always available for drying tests of any manufacturer's products.

## Pulverizing Machinery Co..... 170

One of the younger but now thoroughly established and successful concerns in the field. Executive offices, Research Department, and well equipped manufacturing plant are located at Roselle Park, N. J. Technical Sales representatives are located in large cities throughout the country. Has specialized in difficult grinding problems, in elimination of dust nuisance, etc., and has now some eight hundred of its patented "Mikro-Pulverizers," or special grinders, Disintegrators, Blenders, Dispersers, in use in the Chemical, Food, Mineral, and other industries.

## R

## Reliance Gauge Column Co..... 171

Organized in 1884 on the patenting of the Reliance float-operated water column, a whistle alarm for guarding boiler water levels. This company was one of the pioneers in its field and in recent years has been one of the leaders in the development of boiler alarms for high pressure. It now produces safety water columns, gage cocks, and water gages for pressures up to 2000 pounds, its Mica-sight water gage being particularly notable in surmounting the limitations of glass in such devices. But the most important achievement of Reliance engineers has been the Reliance Monel Float, made by an original process, resulting in extraordinary buoyancy and dependability.

## Republic Flow Meters Co..... 172, 173

In 1910 Republic engineers, men prominent in the field of industrial engineering, designed and built the first electrically operated flow meter ever placed in industrial service—the flow meter which made remote registration possible. In 1921, J. M. Spitzglass, Vice-President, was awarded the Edward Longstreth Medal of Merit, by the Franklin Institute, "in consideration of the novelty of measuring electrically, the flow of fluids in pipes, and the mechanical simplicity and excellence of the measuring apparatus." Pioneering has not ceased. Today this company manufactures a complete line of industrial instruments containing features which only pioneer engineers could produce—features which only experience covering all problems in instrument application could perfect.

## Republic Steel Corp'n..... 176

Twenty-six plants making steel and steel products. Twenty-four sales offices in principal cities of America. One of the world's largest producers of alloy steels. America's second largest producer of bar and strip. America's third largest maker of sheet steel and pipe. Makers of Agathon Alloy Steels, Enduro Stainless Steels, Toncan Copper Molybdenum Iron Sheets and Pipe, Republic Electric Weld Pipe, Upson Bolts, Nuts, Rivets, Turnbuckles, and Witherow Die Rolled Products.

## Riley Stoker Corp'n..... 174, 175

For fifty-nine years the Riley Stoker Corporation and subsidiaries have been serving the steam producing plants of America, Canada and foreign fields. The Riley Stoker Corporation manufactures and installs complete steam generating units consisting of Riley Boilers, Superheaters, Economizers, Air Heaters, Water Cooled Furnaces, Steel Clad Insulated Settings, all types of stoker equipment, pulverizers and burners and flue gas scrubbers. The company has installed in the last few years many of the country's outstanding installations of steam generating units.

## Rivett Lathe & Grinder Corp'n..... 177

Established 1923 to take over the business of predecessor Rivett Lathe and Grinder Company, a business established in 1884. For the last eleven years this corporation has specialized in the development of Automatic Lubricating equipment and controls a large number of important patents in the automatic lubrication field. The corporation also continues the business of manufacturing high grade precision bench lathes, internal and external grinders and allied products.



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## Robertson, John, Co. (Inc.)..... 178

Founded in 1858, this company has been a pioneer builder of hydraulic machinery. Lead pipe extrusion machinery was its specialty until 1885 when the lead cable encasing die-block was invented by John Robertson. The development of lead cable encasing presses and the allied equipment which consists of hydraulic pumps, lead melting furnaces, etc., has continued without interruption and today the outstanding installations of lead presses are Robertson built. Robertson extrusion machinery is the result of over 74 years' experience in the design and manufacture of this equipment. Always pioneers, Robertson engineers have designs ready which are well ahead of the industry's requirements.

## Roebbling's, John A., Sons Co..... 179

Wire rope was first made in America by John A. Roebbling in 1840. It was first used on the Portage Railway Incline Planes for raising and lowering boats. This was the beginning of the great wire rope industry, and also the origin of the present John A. Roebbling's Sons Co. Throughout the years, from pioneer days to the present, this Company has steadfastly maintained its reputation for the unexcelled quality and performance of the products it manufactures. A most important factor in its superior quality is the steel itself, which is made in their small open hearth furnaces at Roebbling, N. J., thus insuring a uniformly pure steel of maximum fatigue resisting qualities.

## Roots-Connersville Blower Corp.... 180

Manufacturers of air, gas, and liquid handling equipment, whose predecessor units have been serving industry since 1854. In addition to their well-established line of Rotary Positive Blowers, Gas Pumps, Cycloidal Liquid and Vacuum Pumps, and Displacement Meters, Roots-Connersville now builds a complete line of Centrifugal Pumps and Blowers based on designs perfected by engineers with more than a quarter century of experience in this field. Within recent years, the R-C Harrison Purging Machine has been introduced for use in gas works, chemical plants, oil refineries, and wherever else inert gas, economically produced, is required in quantities. Another recent development is a line of Turbine Pumps for handling comparatively small quantities of liquids at heads up to 500 ft.

## Ruggles-Klingemann Mfg. Co..... 181

This company is the outgrowth of a selling Agency dating back to 1900. Have manufactured R-K products since 1915. Although young in the manufacturing field, yet old in experience, as their Chief Mechanical Engineer is a man of over forty years' experience in the design of pressure and regulating devices, in which they specialize. They are prepared to furnish R-K Step Action Damper Regulators, Temperature Regulators, Chronometer Valves, Pump Governors, Pressure Reducing Valves, Bleeder Checks, Solenoid, Thrustor, and Motor Operated Valves.

S

## SKF Industries (Inc.)..... 182

For more than a quarter of a century the SKF Organization has been manufacturing Ball and Roller Bearings. SKF provides a supervision of fifteen factories and over 200 factory offices throughout the world and an international organization for scientific research in engineering, manufacturing and merchandising to assure to the user a full measure of performance in products endorsed with the mark SKF. SKF Bearings are made in a wide variety of types to meet practically every need, and SKF bearing recommendations therefore are unbiased. Wherever shafts turn, SKF Bearings are used. They not only reduce friction's toll to a minimum, but effect considerable savings in maintenance and attention.

## Safety Grinding Wheel & Machine Co. 177

This company was established in 1893, and was one of the very early producers of grinding wheels made from either artificial or natural Abrasives. Several important improvements in the application and use of grinding wheels were marketed, but there being no suitable machinery for competently working out these improvements, a Machinery Department was added for this purpose in 1898.

The Safety line is complete and up to date, both as regards grinding wheels and grinding machinery. The Slogan "A Wheel for Every Purpose" correctly befits our facilities for service to date.

## Sarco Co. (Inc.)..... 183

Being one of the pioneers in the design and manufacture of thermostatic devices, the high standard of excellence of Sarco Steam Traps and other specialties is the result of more than 22 years' experience in this specialized field. In addition to steam traps, Sarco products also include Temperature Regulators, Strainers, Radiator Traps, Packless Inlet Valves, Air Eliminators, Return Traps, Alternating Receivers, Compound Gages, Pipe Savers, and Recording Thermometers. For the convenience of architects and engineers they maintain a competent force of practical heating engineers who are available for consultation.

## Schubert-Christy Corp'n..... 184

For more than a score of years Schubert-Christy Cooling Towers have been serving industry in the cooling of water. They manufacture mill fabricated cooling towers in atmospheric, forced draft, induced draft and combination draft types. This company pioneered the modern type of induced draft cooling tower. Bakelite nozzles, and splash plates, copper nails, and heavily cadmium plated bolts are standard equipment. The present line of towers includes capacities from 100 G.P.M. to 40,000 G.P.M. and larger.

## Schutte & Koerting Co..... 185

This firm was founded in 1876 by L. Schutte who was the first in the country to design and manufacture 300 lb. valve which was considered high pressure in those days. A few years later he became associated with E. Koerting, the inventor of the double tube injector, jet condenser and steam jet blower. The firm now manufactures a complete line of jet apparatus of all descriptions, jet condensers, steam jet air pumps, valves, heat exchangers for industrial plants and process work, oil firing equipment, gear pumps and rotameters.

## Scovill Mfg. Co..... 186

This company, established in 1802, is the oldest brass company in America and one of the largest in the world. Its mills produce brass, bronze, and nickel silver, in sheet, rod, wire, and tubing and its manufacturing departments and subsidiary companies turn out a widely diversified line of fabricated products. Metal products for practically every field of industry are included in the list: screw products, forgings, automobile parts and accessories, radio parts, complete metal articles, buttons, common and safety pins, motor driven household appliances, pneumatic valves for tires, plumbing fixtures and so forth.

## Shakeproof Lock Washer Co..... 187

Over ten years ago, when this company introduced its new patented twisted-tooth principle for the locking of nuts, bolts, screws, etc., it was the first lock washer that differed in its design from the old style split type. Its introduction required comparative tests with all other washers used and its quick acceptance by all types of industry proved that the Shakeproof principle was a definite contribution to industrial progress. Other products are the Shakeproof Tapping Screw and the Shakeproof Self-Locking Set Screw. If you have a locking problem, be sure to ask Shakeproof to send one of their skilled engineers to study your problem—this service is free and without obligation.

## Sharples Specialty Co..... 188

An engineering organization primarily devoted to the application of centrifugal force to industry. Manufactures a complete line of centrifugal tools such as centrifugal separators, clarifiers, emulsifiers, and extractors. The Sharples Super Centrifuge develops the highest centrifugal force commercially available. The Sharples Rotorotor Centrifugal has the remarkable ability of discharging its solids while running at full speed. Sharples "Centrifugal Headquarters" maintains complete laboratory facilities where samples are tested and centrifugal engineering advice is furnished gratis.

## Shepard Niles Crane & Hoist Corp'n. 189

Makes a wide line of cranes and hoists and is the largest manufacturer of electric hoists in America. Established over a quarter of a century ago. Plants are located at Montour Falls, N. Y., and Philadelphia, Pa.

## Skinner Engine Co..... 190

Founded in 1868, this company has one of the largest plants in this country devoted exclusively to the building of steam engines. The Skinner "Universal Unaflow" was the first poppet-valve Unaflow engine manufactured in this country, and is built under more than fifty patents owned exclusively by this company. These engines are offered in sizes from 75 to 2000 horsepower. Many "Universal Unaflow" engines have been installed to replace purchased central station current, under the "Skinner Guaranteed Saving Contract," and have paid for their entire cost, including the cost of the generators, in the savings against rates as low as 1.1¢ per kilowatt hour.

## Sly, W. W., Mfg. Co.\*..... 191

Established in 1874. The only manufacturer making a complete line of foundry cleaning equipment. Sly pioneered in the invention and development of positive dust collection and were the original patentees of the cloth arrester. Sly tumbling Mills, Blast Cleaning and Dust Collecting Equipment are thoroughly standardized, enabling us to build quality products at reasonable cost.

## Smoot Engineering Corp'n (see Republic Flow Meters Co).... 172, 173

## Springfield Boiler Co..... 192, 193

Established 1890. For forty-four years engaged in the manufacture of steam boilers of every size and design. For the past 21 years specializing in the manufacture of Springfield Water Tube Boilers and Water Walls, and have made many of the largest and most prominent boiler installations in the United States. Pioneers in the design and Manufacture of water cooled furnaces.

## Squires, C. E., Co..... 194

This business was established in 1904 by Mr. Chas. E. Squires who previous to that had invented the first Squires Boiler Feed Water Controller, Reducing Valve, Steam Trap and Pump Governors which he continually improved upon, working for perfection and simplicity.

## Steel and Tubes (Inc.)..... 195

Established in 1902 as Elyria Iron & Steel Company, later absorbing the Mohegan Tube Company and the Standard Steel Tube Company. Acquired by the Republic Steel Corporation in 1928 to apply the Johnston method of electrical resistance welding to line pipe casing and oil country tubular goods. Over one billion feet of tubing has been produced by the Johnston method since 1921, for countless mechanical and structural purposes. The most recent application of the Johnston method is for "Electrunite" Boiler Tubing, which has received wide acceptance since its introduction.

## Stickley Steam Specialties Co..... 191

Originally the Open Coil Heater and Purifier Co. of 1907. The name was changed in 1923 to identify the concern and the originator that developed a complete line of steam specialties including deaerating feed water heaters, oil and steam separators, steam traps, reducing valves, blast coil heaters and heating specialties. Patented systems for the automatic control of steam, drainage, and boiler return systems were developed for the paper, textile, canning, laundry and other industrial process steam installations, new and improved heating and ventilating equipment for industrial plants, a heating system automatically changing the temperature of the steam by the weather requirements. Local representatives, traveling sales engineers, and supervising erection engineers assure the correct application of the specialties and systems.

## Sturtevant, B. F., Co..... 196

Established in 1864, this company in its own field is the largest manufacturing concern in the world. It is one of the leading industrial enterprises of New England in the size of its plant, the number of its workmen and the amount of its output. The B. F. Sturtevant Co. is particularly noted for its air equipment. Sturtevant Ventilating Apparatus is identified with many of the country's greatest projects, such as the Holland Vehicular Tunnels, connecting New York and New Jersey, the Detroit-Canada Vehicular Tunnel, the Empire State and Chrysler Buildings, etc. The products of this company include, in part, equipment for ventilating, air conditioning, heating, mechanical draft, vacuum cleaning, drying, pneumatic conveying, etc.



## INDEX TO CATALOGS

### Sullivan Machinery Co. .... 197

The foundations of this company go back to a little country blacksmith and machine shop, opened at Claremont, New Hampshire, in 1851. One of those small beginnings, pioneered by Yankee inventiveness and mechanical ingenuity, from which have come large contributions to industrial efficiency and productivity of granite and marble quarrying machinery. Then the invention of the Diamond Core Drill for mineral exploration, followed by the development of Compressed Air Rock Drills, Coal Mining Machinery, Air Compressors, and Hoists, which constitute the bulk of Sullivan contributions to industry today.

### Sun Oil Co. .... 200

Founded in 1886, this company has a record of 48 years' continuous and consistent progress. During this long period, lubricating oils and other petroleum products made by this organization (sold under the trade names "Sunoco" and "Sun Oils") have made for themselves an enviable reputation. For the wide range of other petroleum products as well, such as motor fuel, Diesel fuels and other fuel oils, special process oils, etc., this company has long been regarded as a most dependable source. Through continual process improvements and careful supervision of the various refining steps to insure quality in finished oils, the popularity of this company's products has become widespread. A staff of engineers is maintained. They will gladly co-operate on lubrication and other industrial problems in which petroleum products are concerned.

### Superheater Co. .... 198, 199

Organized in 1910 as Locomotive Superheater Co. to extend use of high degree superheat on American railroads with Schmidt (now Elesco) superheaters, of which 57,000 have been applied. Activities were later broadened to include Elesco superheaters for marine and industrial services, hence, in 1921, company assumed its present name. Now the world's largest superheater manufacturer, it also has the advantage of over 45 years of cumulative knowledge and experience with steam superheating through affiliates in Canada, Great Britain, France, Germany, and Australia. Scientifically correct principles give Elesco superheaters unusual flexibility for handling all steam superheating requirements most economically.

### Swartwout Co. .... 201

D. K. Swartwout, President and Founder of this company, invented the first cast iron exhaust head in 1902. Centrifugal separators followed shortly thereafter; then steam traps, rotary ball bearing ventilators, and feed water heaters. During the same period the "S-C" Regulator Mfg. Co. was successfully developing and applying "S-C" Feed Water Regulators and Pump Governors. In 1927 the Swartwout Co. purchased the capital stock of the "S-C" Company, thus bringing together two highly regarded lines of power plant equipment. In the years that followed this enlarged line has been much improved and extended.

T

### Taylor Instrument Cos. .... 202

Since its beginning in 1851 as a tiny thermometer shop, this company has always specialized in honestly built, high grade instruments. Today, as one of the largest manufacturers of thermometers and allied products, this firm upholds the reputation of Rochester as the home of quality goods. For many years the trade-mark "Tycos" has been used on Taylor Instruments. This is being discontinued to avoid confusion and "Taylor" will henceforth be the trade-mark of all equipment made by this company. These include thermometers, pressure gages, recording instruments, temperature and pressure regulators, cycle controls, time regulators, and humidity indicating and control devices.

### Templeton Bros. (Inc.) .... 203

Organized in 1905 by Wm. R. Templeton for the manufacture of a general line of machinery. In 1906 they placed their first steam trap on the market known as the Sterling Trap and in 1909 their first Return Trap. In 1921 Wm. R. Templeton with his sons started the present company for the exclusive manufacture of Return Traps for pumping boiler return or draining condensers.

### Terry Steam Turbine Co. .... 204

Founded by Edward C. Terry, who began experimenting with a new type of steam turbine engine in the year 1888. Mr. Terry applied for his first turbine patent in 1892, and others followed in 1899 and succeeding years. By 1903, with a shop consisting of an engine lathe, a milling machine, and a planer, he was producing a turbine a month. In 1906 the business was incorporated under the present name. The business grew rapidly and additional designs and types were added, including multi-stage machines for bleeder and mixed pressure operation. Today this company is the only concern in the United States that concentrates its output on steam turbines. Its machines are in use throughout the world.

### Timken Roller Bearing Co. .... 205

In the 36 years that this company has been making tapered roller bearings, exclusively, its field has expanded so broadly that it has become the largest manufacturer of roller bearings. Over 90% of the world's manufacturers of automobiles and motor trucks have standardized on these bearings for the points of hard service and their application to industrial machinery has increased so rapidly over the last decade that there is no type of equipment in which these bearings are not used. These applications range all the way from the precision work on machine tool spindles to heavy duty jobs of steel mill roll neck applications. The company makes its own steel and has become one of the largest alloy steel manufacturers.

### Titeflex Metal Hose Co. .... 206

This company was organized in 1916 to develop a flexible all-metal tubing on a radically new principle in which pioneer work was necessary to develop to a satisfactory commercial conclusion the many details encountered. This development work required painstaking and expert engineers of the highest quality who have been in constant attendance since the company's inception. This company created and developed the new art of applying flexible oil and gasoline tubes to the automobile and aeroplane. Titeflex tubing is constructed to withstand high internal pressure when carrying liquids or gases.

### Torrington Co. .... 210

This business was founded in 1866 as the Excelsior Needle Company, engaged primarily in the manufacture of all types of machine needles.

Some twenty-five years ago the manufacture of precision ball bearings was undertaken and within the past two years a line of needle bearings has been developed—utilizing the experience of seventy years of needle manufacture and twenty-five years of ball bearing manufacture.

### Troy Engine & Machine Co. .... 207

This company was organized in 1890 and operates its own foundry, machine shop and power plant. In 1929 Engberg's Electric & Mechanical Works, St. Joseph, Mich., was purchased and moved to Troy where both Troy and Engberg equipment, as previously supplied, is being built. This consists of various types of vertical and horizontal steam engines, direct and alternating current generators, and direct and alternating current steam engine driven generating sets.

### Twin Disc Clutch Co. .... 208

This company was organized in 1917 and first developed a special tractor clutch which was immediately accepted and used by many leading tractor manufacturers. Later, a more complete line of Twin Disc power take-off units and clutches were developed and the company expanded to serve the road building, construction machinery, machine tool, oil field, textile and woodworking industries. Today, over 400 types and sizes of clutches are offered by this company. Today, 95 per cent of the road building, material handling and construction machinery is Twin Disc Clutch equipped.

U

### United Conveyor Corp'n. .... 209

Represents the combined experience of five companies, all specializing in soot and ash

handling by air through pipe line conveyors, and dating back to the origination of this type of system. In the last six years, however, United brought out the "Nuveyor" and the "Steamatic" Ash and Soot Conveyors, which have largely displaced former methods in this field. The reasons for this progress can best be found by visiting jobs where these two new systems are operating—there are now several hundred installations.

### United States Hoffman Machinery Corp'n. .... 210

Manufactures diversified group of machinery products. Known for thirty years as largest manufacturer of garment pressing machines. Hoffman miniature steam boilers lead all others in sales. Hoffman washing machines, high speed centrifugal extractors and drying tumblers widely used in laundry and dry cleaning industries. Long experience with centrifugal blowers and vacuum producers. Recently introduced Hoffman centrifugal blowers and exhausters, Hoffman vacuum sweeping systems for heavy duty industrial service. Most complete range of sizes and capacities. Centrifugal products designed and built in Hoffman factory by engineers with many years of specialized experience in this field.

### Universal Gear Corp'n. .... 211

This Corporation was established in 1928 to manufacture and develop Heliocentric Speed Reducing Units. In addition to Heliocentric Reducers, a general line of Helical Gear, Bevel Gear and Planetary Gear Speed Reducers and individually designed speed reduction applications are manufactured. This company was a pioneer in the development of Speed Reduction Units with integral motors. Besides marketing its units for all classes of industrial drives, moto-gear and speed reducing elements are furnished to equipment and apparatus manufacturers for integral installations in their products.

V

### Vogt, Henry, Machine Co. .... 212

The initial effort of this fifty-four year old company was devoted to a general machine shop business and the manufacture of tubular boilers. Constantly increasing demands for its products led to expansion into related lines. Today, operating a completely equipped plant occupying nineteen acres, its market for water tube boilers, refrigerating equipment, heat exchangers, drop forged steel valves and fittings and refinery equipment is world-wide.

### Vulcan Soot Blower Corp'n. .... 213

Successors to the pioneer Vulcan Soot Cleaner Company engaged exclusively since 1903 in engineering and production of patented Vulcan Soot Blowers for every type of Water Tube and Return Tubular Boilers, Superheaters and Economizers. Thousands of installations of Vulcan Blowers are in constant and successful use in every State in the Union, Canada and many foreign countries. Vulcan engineers have developed many valuable improvements in operating heads, bearings and elements and present models are the most efficient, reliable and have the lowest maintenance cost of any unit ever built. Vulcan Soot Blowers bear the stamp of approval of leading engineering authorities and power cost finding experts.

W

### Westco Pump Corp'n. .... 213

Westco engineers originated the turbine-type pump which is well known for its ability to produce higher pressures in single stage at standard motor speeds and for its wide operating range characteristic. This company maintains a staff of engineers whose experience covers many years and embraces practically every type of pumping problem. Completely fitted laboratories of the most modern type are at the disposal of these men for development work and for rendering practical and technically reliable assistance to prospects and customers. Products made include Westco Standard Turbine Pumps, Hot Oil Pumps, Sanitary Pumps, Condensa-



## INDEX TO CATALOGS

tion Pumps and Receivers, Automatic Water Systems, Deep Well Pumps and Underwriters' Laboratories Approved Tank Filling Pumps.

### Westinghouse Electric & Mfg. Co. . . . . 214

Founded in 1886 by George Westinghouse, inventor of the airbrake which revolutionized railroad transportation, and developer of the alternating current system which has made electricity a household servant and an invaluable industrial tool. This company gave impetus to motorization of industry by development of the induction motor, introduced the steam turbine, produced and developed the turbine generator. It has 19 works in 18 cities, in 9 states, and normally employs 45,000 people manufacturing almost every kind of electrical product and steam apparatus—more than 30,000 types; more than 300,000 items. Among them are steam turbines, generators, stokers, motors and control, gears, transformers, switchgear, diesel engines, industrial heating apparatus, commercial and industrial lighting equipment, meters and instruments, panelboards, insulators, surge protection, electric refrigerators, household appliances, lamps, foundry products, elevators, X-ray apparatus and a host of related products.

### Westinghouse Traction Brake Co. . . . . 215

Established in 1901 as a subsidiary of the parent organization, the Westinghouse Air Brake Company (formed in 1869) to handle the manufacture and sale of brake equipment for electric railways and air compressors, together with needed accessories. This company, in addition to complete air brake equipment, manufactures for industrial plants, such products as air compressors, governors, reservoirs, cut out cocks, operating valves, brake cylinders, air hose, and connections, and "Wabco" packing cups and gaskets.

### Whiting Corp'n. . . . . 216, 217

For the past half century this company has been engaged in the manufacture of a complete line of equipment for foundries—beginning in the early '80's with the manufacture of the "Whiting" Cupola in Detroit. Since 1894, the company has been located at Harvey, Illinois, and has increased its activities to include a complete line of traveling cranes for all kinds of industrial plants, a

separate line of cost-reducing equipment for railroad repair shops, and special machinery of all types. During the last ten years, it has also taken over and operates as a subsidiary, the Swenson Evaporator Co.—who make a complete line of evaporators and chemical machinery; and the Joseph Harrington Co., who make automatic mechanical stokers for firing boilers. This company also has a modern line of pulverized coal equipment for firing boilers, furnaces, kilns, etc.

### Wing, L. J., Mfg. Co. . . . . 218

Back in 1903, L. J. Wing, founder of this company originated the idea of combining a propeller fan with the steam turbine rotor for driving it. This was followed by a gradual development of the propeller fan for ventilation and forced draft in all its phases, culminating in the well-known line of Wing-Scruplex Fans and Exhausters, Wing turbine and motor-driven blowers and small turbines. Again in 1922, they took the lead in developing unit heating, finally perfecting a uniquely efficient system which is as effective in heating industrial buildings of even the greatest height. This led to the development of Fog Elimination Systems for dye houses and other types of buildings where steam vapors are liberated. More recent developments include variable temperature control heater sections and Wing Process Heating Units, applicable in fog elimination systems and drying processes.

### Worthington Pump & Machinery Corp'n. . . . . 219

In 1840, Henry R. Worthington invented the direct-acting steam pump and in 1841 opened his manufacturing plant. From that point, the organization has progressed and expanded until today this company is one of the world's leading manufacturers of construction, water works, and power plant equipment. Included in its extensive line of products are: Diesel and Gas Engines, Meters, Condensers and auxiliaries, Feedwater Heaters, Pumps of all sizes and types, Multi-V-Drives, Rock Drilling Equipment, Contractors' Air Tools, and Air and Gas Compressors, both Portable and Stationary. Refrigeration and Air Conditioning Equipment. This company is responsible for the design and construction of some of the largest pieces of power plant and water works equipment in America today.

### Wright Mfg. Division of the American Chain Co. (Inc.) . . . . . 220

Started as the Wright Mfg. Co. at Liston, Ohio, about 1895, their reputation for precision machinery has brought to them requests for hoisting equipment, and they gradually worked into the chain hoist field, later adding the Spur-Geared and Differential types, together with Hand Traveling Cranes, Jib Cranes, etc. In 1928 they became associated with the American Chain Company, Inc. Their latest developments include a ball-bearing type Differential Hoist and a new Malleable Iron Spur-Geared Hoist.

Y

### The Yale & Towne Mfg. Co. . . . . 221

In the mind of the general public the name Yale has been associated with quality lock building for almost 100 years but it was not until approximately fifty years ago that this company started to develop products of primary interest to the industrial field. The first step in this program of expansion was the development of the Yale line of chain hoists which has been built up until today it includes the 3 types of hand chain hoists, spur geared and screw geared, and differential chain hoists. Electric hoists, trolleys and general overhead material handling equipment are included in the Yale line. A still further step in the line serving industry was the development of Yale electric products which includes a complete line of low lift, high lift trucks, fork trucks and other products, with many modifications that answer the requirements of industry. A few years ago they acquired the line of hand lift trucks and skid platforms so that today The Yale & Towne Mfg. Co. have products which answer all material handling problems of industry.

### Yarnall-Waring Co. . . . . 222

Established in 1908. For 26 years engaged in the manufacture of Yarway "Seatless" Blow-Off Valves, during which time a group of other high-quality steam specialties have been introduced—including "Floatless" water columns, water gages, and gage illuminators, water level indicators, expansion joints, spray nozzles, hydraulic valves, industrial valves, steam traps, automatic gas valves, and air valves, etc.

Catalogs of the following firms received late, so appear at end out of alphabetical order.
<div style="display: flex; justify-content: space-between;"> <span>National Meter Co.</span> <span>American Gas Furnace Co.</span> <span>Automatic Primer Co.</span> </div>



# CATALOGS OF ADVERTISERS

« »

OVER 1200

PRODUCTS

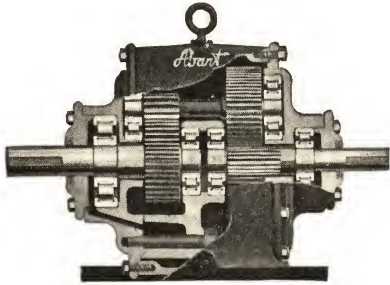
DESCRIBED



# ABART GEAR & MACHINE CO.

4837 W. 16TH STREET, CHICAGO, ILL.

Gears—Spur, Bevel, Helical, Spiral, Worm or Worm Wheels—Metallic or Non-Metallic—Sprockets



Type "CA"

## SPUR GEAR REDUCERS

Highly efficient, compact and durable straight line drive type. Have full ball or roller bearings throughout. Assembled in rigid, substantial, enclosed semi-steel housings, dust proof and oil tight. All gears and shafts are made of heat treated, nickel chromium steel. Overhanging pins, bearings, telescoping shafts, split bearings, floating spiders and like constructions are avoided. All spur gear units can be furnished in the vertical type.

### TYPE "CA"

Straight Line Spur Gear Reducer.

Ratios up to 25 to 1.

Sizes up to 400 H.P.

### TYPE "CC"

Double Spur Gear Reducer. Ratios from 25 to 1 up to 400 to 1.

By combinations such as these it is possible to furnish ratios up to 160,000 to 1.

### TYPE "B"

Combination Worm and Spur Gear Reducer.

Ratios 25 to 1 up to 2000 to 1.

A very compact high ratio right angle drive. The advantages of this unit are its ability to immediately cut down the speed by worm gears and then using spur gears, that are more able to carry heavy torque loads, for final application of power. By using combinations such as the above we are able to furnish reduction up to 20,000,000 to 1 if required. These units can also be furnished in vertical type.

### TYPE "MOD"

A motorized offset drive, single reduction type.

Maximum ratio of reduction 6 to 1.

Maximum ratio of acceleration 2 to 1.

H. P.  $\frac{1}{6}$  to 3 H.P.

All units equipped with helical type gearing, ball bearing mounted, self-lubricating.

Housings semi-steel, mounted, and doweled to motor.

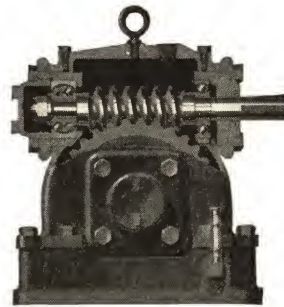
Can be furnished in four positions if required.

### TYPE "DWU"

Vertical Type—Parallel Drive Double Worm Gear Reducer. Specifications same as on "DW" Unit.

Ratios  $23\frac{1}{2}$  to 1 up to 10,000 to 1.

Torque 200 inch lbs. up to 2500 inch lbs.



Type "A"

## WORM GEAR REDUCERS

Scientifically designed and constructed, full ball bearing throughout, highly efficient and compact. These units have hardened and ground alloy steel worms and nickel bronze worm wheels with a properly formed tooth giving a maximum rolling action and minimum sliding action, thereby insuring the maximum efficiency. Assembled in a semi-steel, oil tight housing with bearing supports for both worm and worm wheel machined in one casting which insures absolute permanent alignment, eliminating split bearings and shims.

### TYPE "A"

Worm Gear Reducer.

Ratios  $4\frac{5}{8}$  to 1 up to 100 to 1.

$\frac{1}{2}$  H.P. to 98 H.P.

### TYPE "AB"

(Not Illustrated)—Same as above with exception that worm is on the bottom.

### TYPE "AD"

Worm Gear Reducer—Vertical Type—Making this ideal for fastening to the top, bottom or end of tanks and agitators, thus forming an integral part of the tank. Shaft can project either on top or bottom.

Ratios and Horse-powers same as Type "A" Unit.

### TYPE "SA"

Fractional Horse-power Worm Gear Unit.

Same specifications as our larger units.

$\frac{1}{10}$  H.P. to  $\frac{1}{2}$  H.P.

Ratios  $5\frac{1}{4}$  to 1 up to 100 to 1.

### TYPE "SAC"

Vertical Type fractional Horse-power Worm Gear Unit. Shaft can project either on top or bottom.

$\frac{1}{10}$  H.P. to  $\frac{1}{2}$  H.P.

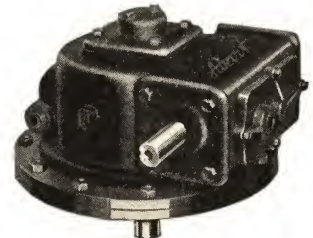
Ratios  $5\frac{1}{4}$  to 1 up to 100 to 1.

### TYPE "DW"

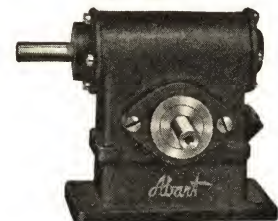
Parallel Drive Double Worm Gear Reducer. High Speed and intermediate worm shafts are of an alloy steel hardened and ground. Mounted on Ball-bearings. Worm Gears are of a nickel bronze.

Ratios  $23\frac{1}{2}$  to 1 up to 10,000 to 1.

Torque 200 inch lbs. up to 2500 inch lbs.



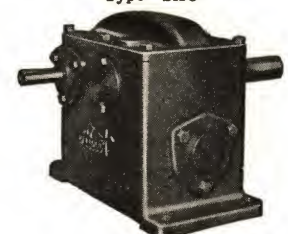
Type "AD"



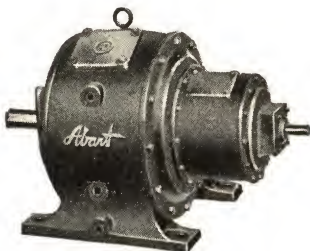
Type "SA"



Type "SAC"



Type "DW"



Type "CC"



Type "B"



Type "MOD"



Type "DWU"

Send for Catalog.



# ALCO PRODUCTS INCORPORATED

Division of AMERICAN LOCOMOTIVE COMPANY

EQUIPMENT DIVISION, 220 EAST 42ND STREET, NEW YORK, N. Y.

Cable Address: "ALPRODUCTS"

PLANTS: DUNKIRK, N. Y., AND MONTREAL, CANADA

CHICAGO . . . . .	McCormick Bldg.	SAN FRANCISCO . . . . .	Rialto Bldg.
HOUSTON . . . . .	Esperson Bldg.	TULSA, OKLA. . . . .	Philtower Bldg.
WASHINGTON, D. C. . . . .			Barr Bldg.

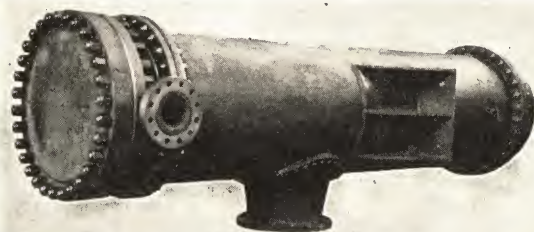
## PRODUCTS:

**Heat Transfer Equipment:** COOLERS: Hydrocarbon Oil, Condensate, Lubricating Oil, Quenching Oil, Vegetable Oil, Transformer Oil, Engine Jacket Water, Water, Gas, Air, Brine, Inter and After, Chemical Fluid, Coal Tar Product.

HEATERS: Hydrocarbon Oil, Pipe Line, Fuel Oil, Extraction or Bleeder, Feed Water, Chemical Fluid, Juice, Instantaneous, Reboilers, Vaporizers, Preheaters, Evaporators.

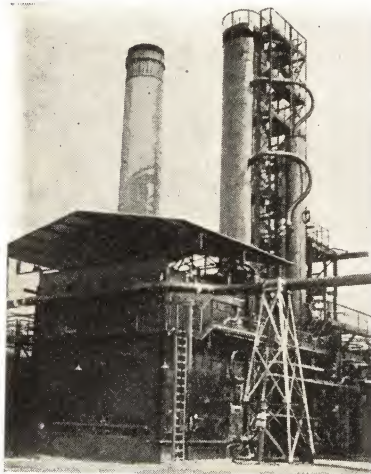
HEAT EXCHANGERS: Oil to Oil, Vapor to Oil, High Pressure, Continuous Blow Down, Waste Heat, Chemical Fluid, Hot Water Converters, Coal Tar Products.

CONDENSERS: Vapor, Reflux, Vacuum, Partial, Evaporator, Steam, Ammonia, Barometric.



Shop View of Vertical High Pressure Feed Water Heater

**Steel Plate Work:** Bubble Towers, Mixing Tanks and Kettles, Vulcanizers, Digesters, Desuperheater Tanks, Ammonia Receivers, Absorbers, Autoclaves, Blast Furnace Work, Brick Hardening Cylinders, Concrete Forms, Creosoting Cylinders, Flumes, Fractionating Towers, Impregnators, Pressure Tanks, Riveted Steel Pipe, Scrubbers, Shaft Linings, Special Buckets, Stills, Storage Tanks, Tunnel Shields, Access Shafting, Agitators, Airlocks, Penstocks, Cement Kilns, Condenser Boxes, Electric Welded Steel Pipe, Special Vessels, Retorts.



Oil Distillation Unit Designed, Fabricated and Erected by Alco Products Incorporated

**For the Petroleum Industry:** Alco offers a complete service in the engineering, designing, fabrication and field construction of complete, modern Oil Refining Plants, and of such major items of refinery equipment as Complete Cracking Plants, Atmospheric or Vacuum Distillation Units for crude or rerun operation, Tube Stills for distillation or cracking plants, Fractionating Towers, Treating

Plants, and Gasoline Absorption, Stabilizing and Debutanizing Plants. Designs incorporate a high degree of flexibility, allowing ample reserves for varying operating conditions, with full consideration to low capital investments and operating costs.

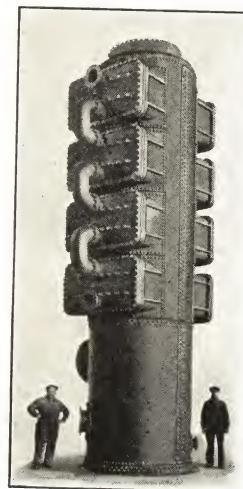


## FABRICATING FACILITIES:

Alco equipment is fabricated in the great plant of the American Locomotive Company at Dunkirk, N. Y.—operated by a thoroughly trained organization—with a diversity of shops, including foundry, forge, plate, pipe and machine departments. All workmanship is of the high standard traditional with the American Locomotive Company.

## EXPERIENCE:

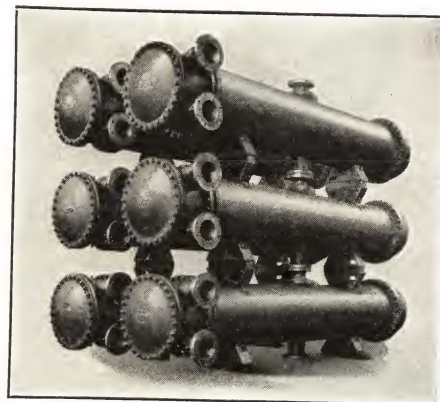
Alco offers years of successful experience in the design and manufacture of advanced types of heat transfer equipment for a wide range of industries, including power plants and central stations, petroleum, chemical, process, refrigeration, marine and general manufacturing. Alco equipment is in successful use by leading organizations in the United States and other countries.



Combined Vacuum Condenser and Run Down Tank for Use on Vacuum Stages of Petroleum Distilling Unit. (Patent Applied for)

## SERVICES:

The Alco technical staff invites opportunity to co-operate in designing special equipment to solve, effectively and economically, the particular problems of individual plants or industries. In addition to the staff in the main office, experienced sales and service engineers are conveniently located in important industrial centers.



Two Batteries of Gasoline Vapor Condensers for Large Southern Refinery

Mechanical Catalog (1934-35)



# ALEMITE CORPORATION

Division of STEWART-WARNER CORPORATION

1876 DIVERSEY PARKWAY, CHICAGO, ILL.

CANADA: STEWART-WARNER-ALEMITE CORP., Belleville, Ont.

The fundamental principle of Alemite Lubrication is pressure: Pressure that forces the lubricant through dust-proof Alemite fittings installed in machinery bearings—pressure that cleans the bearings by flushing out the old grease while it packs the bearing with fresh lubricant.

Irrespective of the type of Alemite system used, Alemite Lubrication will effect substantial savings in not only maintenance but also power consumption (by reducing starting torque)—labor (by requiring less time to clean as well as to lubricate machinery)—and lubricant consumption (because one pound of solidified oil

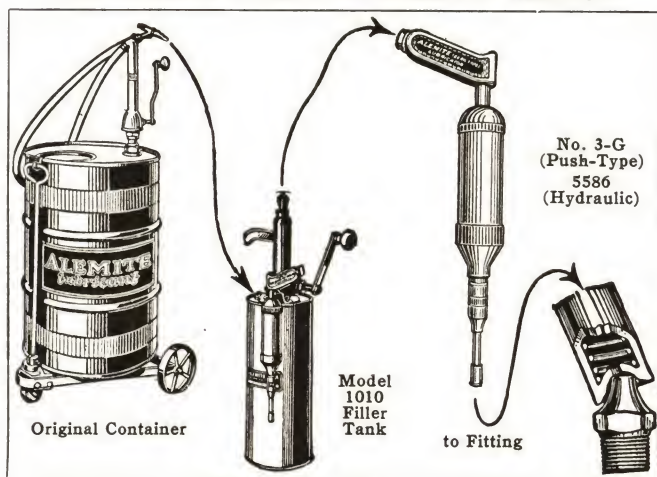
## ALEMITE

Reg. U. S. Pat. Off.

will do the work of two gallons of liquid oil). In addition, accidents resulting from slippery floors are eliminated because lubricant can not run out of Alemite fittings.

Actual installations in plants in all types of industry have proved that an annual saving equal to 200% of the original cost of Alemite equipment is possible in lubricants and labor alone. Even greater savings may accrue from the absence of shut-downs for repairs! Nearly 1000 manufacturers of industrial machinery employ the Alemite System as standard equipment on their machines.

### THE ALEMITE "BARREL-TO-BEARING" METHOD



With either the Alemite Push Type System or the new Alemite Hydraulic System it is possible to transfer a semi-solid lubricant from its original container (400-lb. drum) to any bearing in which an Alemite fitting is installed, without the lubricant being touched by human hands or being exposed to contamination by dirt or other abrasive matter. A special barrel pump is used to transfer the lubricant from drum to Alemite Filler Tank, which in turn permits the lubricant to be transferred to the Alemite Gun, whence it is forced under high pressure into the Alemite-equipped bearing (See diagram above.)



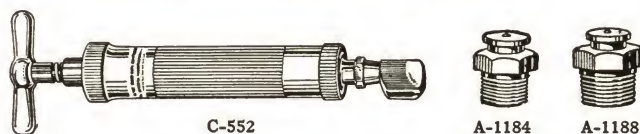
There is a size and type of Alemite fitting (Push Type or Hydraulic) for every bearing—threaded fittings to replace oil and grease cups; drive fittings to close up oil holes. Alemite fittings contain ball check valves to keep out dust and dirt and keep in the lubricant.

**Alemite Filler Tank (Model 1010):** Portable; holds 20 lbs. of lubricant. Bracket on side provides a convenient place to carry the Alemite Gun, which has a removable plug in the handle to permit its being filled by placing the open end over the Filler Tank spout. One turn of the Filler Tank crank will fill a nine-ounce gun.

**An adapter (Model 5329)** will permit the use of either a Push Type Gun or a Hydraulic Gun on Alemite Pin Type fittings. Thus even older machinery which is equipped with the original Alemite System (Pin Type) can quickly be converted to the Alemite Barrel-to-Bearing principle.

**Last Word in Positive Lubrication:** The Alemite Hydraulic Lubrication System embodies a new principle in high pressure lubrication. A gun containing a coupling of entirely new design is used in combination with a new style fitting or nipple to effect a seal that is positive—so positive that the higher the pressure developed, the tighter the coupling grips the fitting. This feature prevents the gun from slipping off a fitting so long as pressure is being applied. Yet this contact can be broken at the will of the operator merely by his bending the gun sidewise.

Owing to its LOCKING security plus improved construction of the Hydraulic Gun, the Alemite Hydraulic System permits far greater pressure to be developed than can be developed with corresponding gun of any other system. Pressure up to 10,000 lbs. per square inch can be developed with only a *hand* gun.



### FOR SPECIAL INDUSTRIAL APPLICATIONS

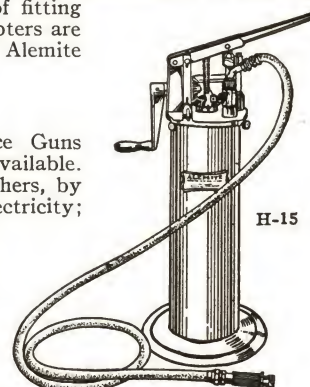
**Alemite Buttonhead:** Includes rugged steel fittings which are practically indestructible in service. Widely used on cranes, shovels, conveyors, etc. Gun (C-552) has slip-on coupling to connect it to buttonhead fitting A-1184 ( $\frac{1}{8}$ " P.T.) or A-1186 ( $\frac{1}{4}$ " P.T.) or A-1188 ( $\frac{3}{8}$ " P.T.).



**Alemite-Dot:** Used extensively on heavy-duty machines and in canning and baking industries. Contact established by one-half turn of gun on threaded head of fitting which is steel. All types of adapters are available for use with standard Alemite Service Guns (H-15, etc.).

### LARGER GUNS

A variety of Alemite Service Guns (of larger lubricant capacity) is available. Some are operated by hand; others, by compressed air; others, by electricity; others, by steam. They vary in capacities from 5 lbs. to 400 lbs. Illustrated is the manually operated Model H-15 (15-lb. capacity).



### ALEMITE LUBRICANTS

Grades to meet all types of industrial application. No. 33 is a pure solidified oil with melting point of 205° F. No. 38 and No. 39 (non-fibrous) are for anti-friction bearings. They have melting points of 350° F. and 380° F., respectively.

**Automatic (Reservoir) Cups:** Lubricant is kept under pressure by an internal spring (adjustable). Spring can be had in any of various tensions. Cup capacities, from  $\frac{1}{2}$  oz. to 4 oz. Shank sizes, from  $\frac{1}{8}$ " P.T. to  $\frac{1}{2}$ " P.T. Fill holes,  $\frac{1}{8}$ " P.T. and  $\frac{1}{4}$ " P.T. (See cut below.)



### DISTRIBUTION

Alemite Equipment is now distributed by selected jobbers as well as by Factory-appointed distributors in all principal cities. Write for name of jobber or distributor who can serve you and who will be glad to recommend equipment best suited to your individual needs.



# ALLIS-CHALMERS MANUFACTURING CO.

MILWAUKEE, WIS.

Cable Address: "FOUNDERS"

Manufacturers of Power, Electrical and Industrial Machinery

## DISTRICT OFFICES

ATLANTA, GA. . . . . Healey Bldg.  
BALTIMORE, MD. . . . . Lexington Bldg.  
BIRMINGHAM, ALA. . . . . Webb Crawford Bldg.  
BOSTON, MASS. . . . . State Mutual Bldg.  
BUFFALO, N. Y. . . . . Liberty Bank Bldg.  
CHARLOTTE, N. C. . . . . Johnston Bldg.  
CHATTANOOGA, TENN. . . . . Tennessee Electric Power Bldg.  
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CINCINNATI, OHIO, . . . . . First National Bank Bldg.  
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PITTSBURGH, PA. . . . . Park Bldg.  
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RICHMOND, VA. . . . . Electric Bldg.  
ST. LOUIS, MO., . . . . . Railway Exchange Bldg.  
SALT LAKE CITY, UTAH . . . . . Kearns Bldg.  
SAN ANTONIO, TEXAS, . . . . . Frost Bank Bldg.  
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WASHINGTON, D. C. . . . . Southern Bldg.  
WILKES-BARRE, PA., . . . . . Coal Exchange Bldg.

## FOREIGN DISTRICT OFFICES

SANTIAGO, CHILE . . . . . Sociedad Manufacturera Allis-Chalmers  
LONDON, ENGLAND

BUENOS AIRES, ARGENTINA, Allis-Chalmers Mfg. Co. (Argentina)  
URURO, BOLIVIA  
LIMA, PERU

CANADIAN REPRESENTATIVES: Canadian Allis-Chalmers, Ltd., TORONTO

## PRODUCTS

STEAM TURBINES AND CONDENSERS.  
HYDRAULIC TURBINES (see page 7).  
STEAM, OIL AND GAS ENGINES.  
BLOWERS AND COMPRESSORS: Centrifugal, Rotary, Reciprocating.  
PUMPS: Centrifugal and Plunger; Pumping Engines.  
TEXROPE DRIVES; TRANSMISSION MACHINERY.  
MOTORS: of any size for any application.  
GENERATORS: Alternating or Direct Current; Synchronous Condensers.  
TRANSFORMERS: Power; Distribution; Network; Instrument; Metering; Feeder Regulators.



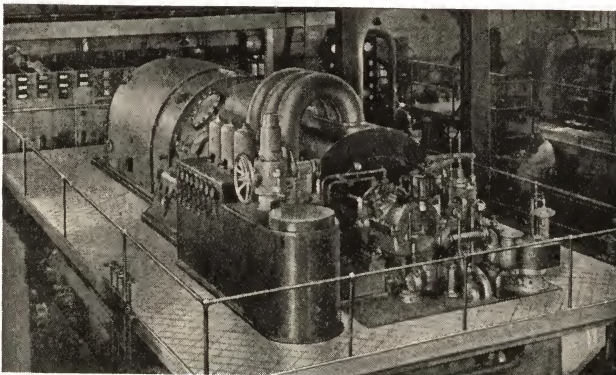
CONVERSION EQUIPMENT: Mercury Arc Power Rectifiers; Synchronous Converters; Motor-Generator Sets.

SWITCHGEAR: "Armored" Type Circuit Breakers; Switchboards; Control; Generator Voltage Regulators.

RAILWAY ELECTRIFICATION EQUIPMENT.

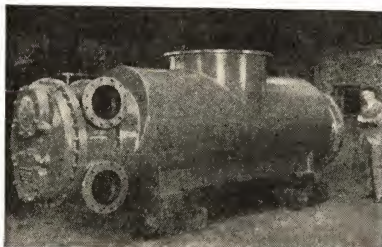
INDUSTRIAL MACHINERY: Rock and Ore Crushing; Cement Making; Mining and Metallurgical; Coal Distillation; Timber Preserving; Flour and Cereal Milling; Sawmill and Wood Conservation; Road Grading; Tillage, Planting and Threshing; Combines; Wheel and Track-Type Tractors; "AKON" Boiler Treatment.

## STEAM TURBINES



7500-Kw., 3600-Rpm. Steam Turbine and Alternator Unit  
Designed for 440-Lb. Pressure, 750° F. Total Temperature, 29" Vacuum

Efficient, reliable Steam Turbine and Generator Units are built from 200 kw. to 150,000 kw. for modern steam pressures and temperatures. These include condensing and non-condensing, automatic extraction and mixed pressure types.



Two-Pass Welded Steel Condenser

Impulse Turbines are built for auxiliary drive.

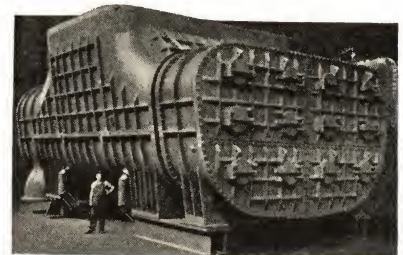
## ENGINES

Corliss Engine-Generator Units: 200 to 2500 kw., are built for specific steam power and supply demands. Gas Engine-Generator Units, 500 to 6000 kw.,

are designed for operation on producer, natural, illuminating, coke oven or blast furnace gas.

## CONDENSERS

Built in surface and jet types in all sizes, including auxiliary steam jet air pumps, condensate and circulating water pumps, and motors.

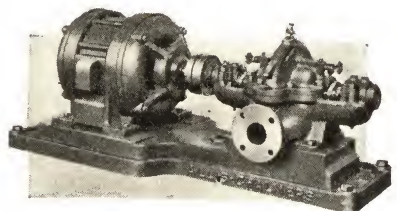


52,500 Sq. Ft. Single Pass  
Cast Iron Condenser

## CENTRIFUGAL PUMPING UNITS

The ALLIS-CHALMERS MANUFACTURING COMPANY makes a specialty of *combined units* consisting of pump and motor power of their own manufacture as the best way of giving purchasers a complete unit with both pump and drive properly proportioned and with undivided responsibility for the performance of the unit as a whole.

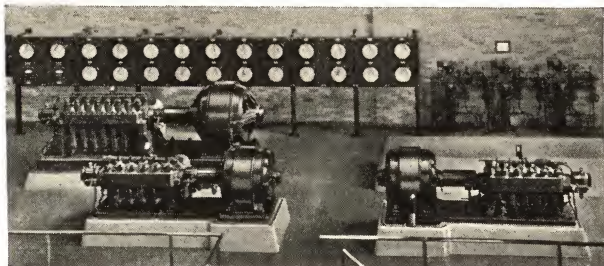
**Single Stage Type**  
"S" is the most generally used pump. It is a single stage, double suction, horizontal shaft, bronze fitted pump built in sizes 1½ in. to 30 in. discharge; capacities 30 to 42,000 g.p.m.; heads up to 200 ft., and in some of the smaller sizes for still higher heads.



Motor Driven Type "S" Pump

The type "LS" is a lower head type "S" pump used for condenser circulating pumps, sewage pumps, drainage pumps and any other service requiring large capacities against relatively low heads. Built in sizes 24 in. to 60 in.





Type "M" High Pressure Boiler Feed Pumps

**Multistage Centrifugal Pumps:** The double suction type "M" built in sizes 2½ in. to 16 in. and good for pressures up to 1500 lbs. in some sizes depending on arrangement; the type "ST" built in sizes 2½ in. to 14 in.; the type "HYC" which has two back-to-back impellers and is built in sizes 4 in. to 14 in.

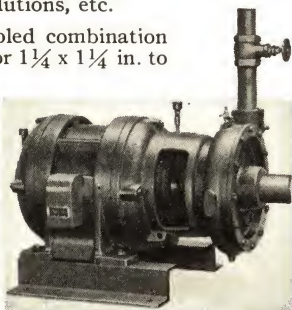
The type "M" pump is used for boiler feed service, oil pipe line pumps, fire service, high pressure water supply and similar applications. *Bulletin 1642-B.*

The Type "SSOR" Pump is used for handling high consistency paper stock, for sewage service, for mash, distillery slop, etc., etc.

**Type SSA:** For acids, caustic solutions, etc.

The Type "SSU" is a close-coupled combination pump and motor unit built in sizes for 1¼ x 1¼ in. to 5 x 4 in. sizes for heads up to 100 ft. and in some of the sizes 200 and 350 ft. These pumping units have a multitude of uses, water supply, air conditioning, refrigerating, swimming pools, washing, oil industry and anywhere else a small, reliable, efficient pumping unit is required.

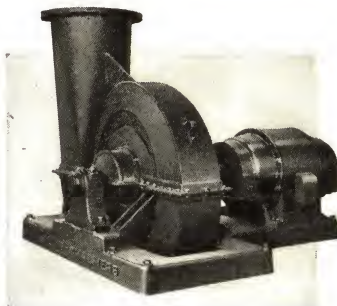
*General Catalog 1651* describing the Company's complete line of Centrifugal Pumps sent on request.



Type "SSU"

## BLOWERS AND COMPRESSORS

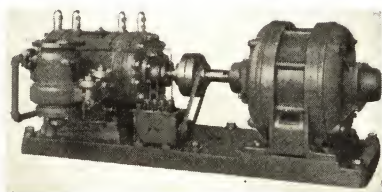
**Centrifugal Blowers and Compressors:** Motor or turbine driven, are built for volumes up to 130,000 c.f.m. in single and multi-stage types, for such applications as Blast Furnace blowing, Converter and Cupola blowing, Gas Boosting and Exhausting, Sewage Aeration, etc. *Leaflets 1907, 1908 and 2180.*



Motor Driven Turbo-Blower  
32,000 C.f.m. at 2 Lbs. G

**Sliding-vane" Compressors and Vacuum Pumps:** Are available for volumes up to about 2000 c.f.m. at pressures up to 150 lb. G and vacuums up to 29.85 in. mercury. *Leaflets 2159 and 2171.*

**Reciprocating Compressors and Vacuum Pumps:** Are built for the large capacities and for pressures up to 5000 lbs. G.

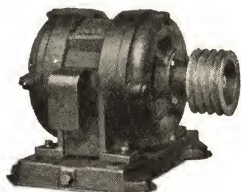


Rotary Compressor

## POLYPHASE INDUCTION MOTORS

Squirrel-cage and wound-rotor induction motors are built in all standard ratings, 1 hp. and larger.

**Squirrel-cage Motors** are built with normal or high starting torques (normal or low starting current), single or multi-speed, in all sizes; and in general purpose ratings as totally enclosed fan-cooled, explosion-proof,

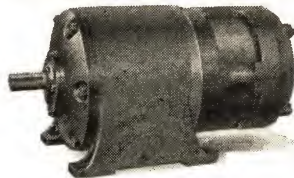


AR Motor

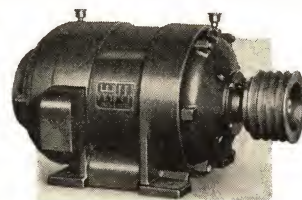
"gearmotor," "Sealclad" textile and elevator types.

**Wound-rotor Motors** are available in open or enclosed types for general industrial service and for rolling mill, crane and hoist applications.

**Type AR** squirrel-cage and **Type ARY** wound-rotor motors, of the general purpose class, have cast steel frames, twistless and distortionless stators, moisture-proof insulation, oil and dust tight sleeve or anti-friction bearings in extra rigid housings and efficient ventilation. Squirrel-cage windings are silver-brazed and indestructible. *Leaflet 2173.*



Type I Gearmotor Unit

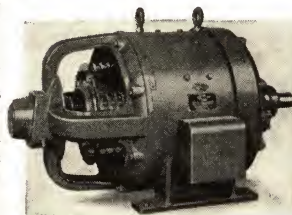


Totally Enclosed Fan-Cooled Motor

**Type AN** squirrel-cage and **Type ANY** wound-rotor motors, of the larger ratings, have box-type welded or cast yoke frames and incorporate all the desirable qualities of modern design. *Bulletin 1156.*

## DIRECT CURRENT MOTORS

General purpose, **Bracket Bearing Type D.C. Motors** are built in standard ratings up to 200 hp. for constant speeds (60-cycle motor speeds). Adjustable-speed motors of constant or tapered horsepower ratings are available for speed ranges up to 6 to 1. Both types are also built for vertical service. **Large D.C. Motors** ("Frog Leg" Wound) are built for rolling mills, hoists, oil well drilling, paper machine drive, etc.

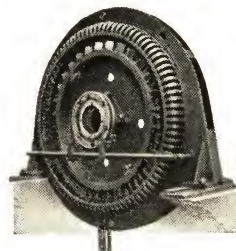


Large Bracket Bearing Type  
D.C. Motor

## SYNCHRONOUS MOTORS

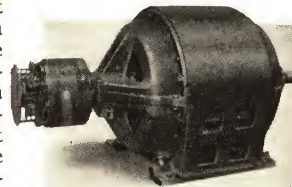
Built in belted, coupled and engine types. Construction is standard open type, semi-enclosed, fully enclosed forced-ventilated and in the higher speeds—totally enclosed, fan-cooled. Furnished for all practicable speeds and applications; in ratings 40 hp. and larger and for any power factor down to 20% (leading current). Motors for power factors lower than 20% are classed as synchronous condensers.

Starting kva is reduced by careful squirrel-cage design to the lowest values consistent with torque requirements. Sufficient starting and pull-in



Engine Type  
Synchronous Motor

torque can be furnished to start many machines loaded, although unloading is generally advisable where practicable. Careful consideration is given to current-pulsation limitation in motors driving reciprocating machinery and sufficient flywheel effect can ordinarily be built into the motor. Special motors for rapid dynamic braking can be furnished. *Bulletins on request.*



High Speed Synchronous Motor

## TRANSFORMERS

Allis-Chalmers complete line of transformers includes all sizes, frequencies and voltages for power, distribution, regulating, instrument and metering service.

**Power Transformers** are built for any capacity, voltage or service, 3-phase or single-phase, water-cooled, self-cooled, forced-oil-cooled, or self-cooled forced air.

**Distribution Transformers** of the single-phase and polyphase type are built for outdoor, indoor, subway, vault or network service; including surge diverters, network protectors, etc.

**Feeder Voltage Regulators**, non-automatic and automatic, are now available for distribution circuits of any voltage, indoors or outdoors, single or 3-phase.

The distribution line also includes **Low Voltage, Dry Type Transformers** and transformers for miscellaneous applications.

**Current and Potential Transformers** are built for switchboard and general indoor and outdoor application; including combined **Metering Outfits.**

(Continued on next page)



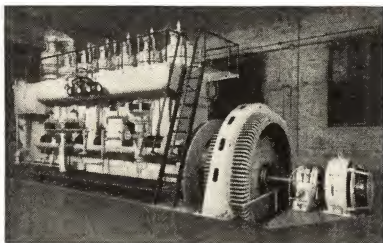
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## GENERATORS

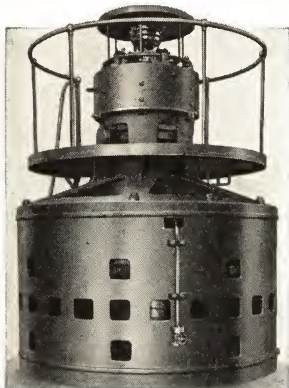
Allis-Chalmers generators include a-c. and d-c. machines of all commercial characteristics and any practicable capacity—

Turbo-generators  
Waterwheel Generators  
Engine Type Generators  
Coupled Generators  
Belted Generators.

Allis-Chalmers is a pioneer manufacturer of generators for use with steam turbines, hydraulic turbines, and every type of engine. Generators of modern design are built in all standard ratings and speeds with various mechanical and electrical modifications to suit special conditions.



1000 Kw. 257 Rpm. Engine Generator



Typical Vertical Generator  
Medium Size Hydro-Electric Unit

**Auxiliary Generating Station**  
Equipment of Allis-Chalmers manufacture includes: exciters; "Armorclad" switchgear and switchboards; generator voltage regulators; instrument and metering transformers; centrifugal pumps; scavenging and supercharging blowers; rotary air compressors; vacuum pumps; and motors.

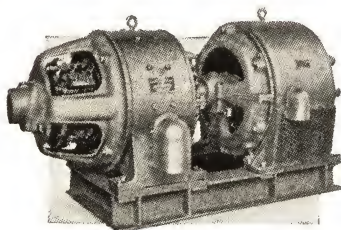
**Generator Voltage Regulators**  
(Brown Boveri Design) have rocking contacts which do not require periodic inspection, adjustment or replacement. Once properly installed they regulate automatically with minimum maintenance. Over 26,000 have been installed in all parts of the world.

## CONVERSION EQUIPMENT

**Allis-Chalmers Mercury Arc Power Rectifiers (Brown Boveri Design):** Convert alternating current to direct current without moving parts, noise or vibrations. They possess the advantage of high efficiency at all loads, low installation, operating and maintenance cost. They operate safely under the most adverse a-c. line conditions and are especially adaptable to automatic control.

Standard rectifiers are built in sizes from 150 kw. at 250 volts up to the highest commercial ratings and voltages (30,000 volts) of converting apparatus. With an inexpensive automatic grid control regulator, the rectifier may be given automatically any desired voltage characteristic. Rectifiers are the ideal converter for railway service and for industrial substations with heavily fluctuating load and low machine load factor.

**Synchronous Converters:** Form another convenient and efficient means of converting from alternating to direct current. They are built in standard ratings to 3000 kw. for industrial, mining and railway service.



150-Kw. Motor-Generator Set

**Motor-Generator Sets:**  
Standard induction sets 1 kw. and larger, and standard synchronous sets 25 kw. and larger, are built for all commercial voltages (and frequencies) for both a-c. and d-c. machines. Sets are built for special purposes, such as flywheel sets for reversing hoist or mill motors, frequency changers, balancers, boosters, equalizing sets, and similar sets.

## SWITCHGEAR

This Company engineers and manufactures a complete line of switchboards, "Armorclad" switchgear, and automatic control boards for power stations, substations and industrial plants; including automatic starters for induction motors and synchronous motors. Allis-Chalmers Reyrolle "Armorclad" Switchgear Units operating safely, compact, reliable, having low maintenance and installation cost, are built and all standard ratings for metal-clad switchgear. *Bulletins and Data on request.*

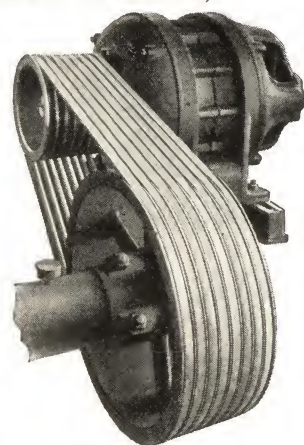
## TEXROPE DRIVES

(TEXROPE—Trade-mark Reg. U. S. Pat. Off.)

"Texrope" is the trade name and registered trade-mark of V-belt drive products of ALLIS-CHALMERS MANUFACTURING COMPANY.

Allis-Chalmers multiple V-belt drive is a patented product. This drive consists of a number of trapezoidal shaped, endless flexible belts running in V-shaped grooves. Power is transmitted by the wedging contact between the Texrope Belts and the grooves in the sheaves.

Texrope Multiple V-Belt Drives are compact—positive—silent—unaffected by dirt or moisture—economical—require no lubrication and little attention.



Typical Texrope Drive

**STOCK DRIVES:** For immediate shipment from various consigned stock points, are available for all popular motor ratings from 1/2 to 100 hp. There are 64 to 83 different ratios for each rating so that practically any speed reduction or increase can be had within the range of 1:1 to 7:1. Complete data in *Catalog 150*.

**TEXSTEEL TEXROPE DRIVES:** 1/4 to 15 hp., also available from stock, supply the demand for a low priced unit. Textsteel sheaves are accurately formed of extremely tough steel, then welded and attractively finished in an aluminum lacquer. They are light in weight and easily installed. *Leaflet 2134A*.

**STANDARD DRIVES:** Not in stock, command early shipment since patterns are on hand and standard drawings are already complete. Standard drives are available for ratings between 50 and 300 hp. *Catalog 150*.

**SPECIAL DRIVES:** Include large or special ratings and drives to suit special conditions, also flywheel sheaves for compressors or crushers, clamp hub or split sheaves, clutch applications, rim sheaves, etc. *Catalog 150*.

**TEXROPE BELTS:** Made in accurately machined molds, in five cross-sectional sizes and various lengths suiting all requirements. These are also available for immediate shipment from various consigned stock points. *Leaflet 2170*.

**Power Transmission Machinery:** For heavy duty continuous operations: Shafting to large sizes; Friction Clutches and Couplings; Bearings, etc.; Cast Iron Pulleys; Tighteners; Rope Transmissions; Iron and Mortise Gears; Fibre and Iron Frictions; and Sawmill and Flour Mill Elevators and Conveyors. Write for *Catalog 142* stating your requirements.

## MATERIAL INDUSTRIES EQUIPMENT

Many of the products listed in the preceding pages, which have their principal application in Power Plants and the Mechanical Industries, also have application in the Material Industries, such as for example, engines, turbines, compressors, pumps, generators, motors, drives, etc.

Allis-Chalmers products for the material industries embrace complete lines of: mining and metallurgical machinery; equipment for quarry, cement and lumber industries; as well as cereal milling machinery. Among the unit operations to which this equipment is applicable are the following:

- Crushing, grinding and pulverizing.
- Screening, sifting, bolting and dust collecting.
- Conveying—rock and ore, flour and cereals, etc.
- Washing and drying—rock, ore, sand, gravel, chemical by-products, etc.
- Roasting, calcining, sintering, cooling—rock and ore, cement, chemical by-products, etc.
- Smelting and refining—non-ferrous ores.
- Converting—copper.
- Flotation, cyanidation, jigging, tabling, classifying—ores.
- Hoisting, tunnelling, hauling—rock, ore, gravel, etc.
- Sawing, defiberizing, handling—logs, lumber and wood waste.
- Preservative treating—timber, piling, poles and ties.
- Distillation—coal.
- Milling, flaking, rolling, crimping, packing—cereals.
- Pumping—all liquids.
- Blowing, compressing, evacuating—air and gas.
- Condensing, heat exchanging—vapors and liquids.
- Storing in tanks, bins, etc.

*Industrial Machinery Bulletins on request.*



# ALLIS-CHALMERS MANUFACTURING CO.

MILWAUKEE, WIS.

*Hydraulic Turbines for All Sizes and Heads. Over 6,000,000 Horse Power Installed and Under Construction*

For Other Products and District Offices, See Page 4

## HYDRAULIC TURBINES AND AUXILIARIES

Allis-Chalmers Manufacturing Co. has for decades been a pioneer in the design and manufacture of water wheels for all conditions of head and capacity. The Company also builds a line of special accessories such as oil pressure governors, central oil pressure systems, pressure regulators, butterfly valves and gate valves. The Company's design and manufacture of such equipment has not been dominated by the consideration of low initial cost, but low permanent cost assured by dependability and simplicity constituting the highest commercial efficiency by increasing operating revenue through freedom from shutdowns and by reducing repair expenses when they become necessary due to natural wear.

Allis-Chalmers has never entertained the idea of carrying in stock a ready-to-install variety of hydraulic turbines but instead has followed a policy of building each turbine to suit its own particular application. For this reason the Allis-Chalmers Manufacturing Co. has so fully covered the field of large hydro-electric units, specially designed for their respective size



and operating conditions. In so doing the Company has developed an organization and built up shop facilities capable of designing and building the largest and the best hydraulic turbines that any given set of conditions may demand.

The Allis-Chalmers Manufacturing Company has designed and built hydraulic turbines totalling well over six millions of horse power in over one thousand working installations for nearly as many different operating heads ranging from 6 feet to 2500 feet. By far, the largest number of these are in the United States and Canada, although the Company has numerous installations in South American countries, Japan, Spain, Philippine Islands and Mexico.

## ROLLER GATES

Allis-Chalmers Manufacturing Company now has under construction six (6) roller gates of the submersible type, each 68' 8" in length and 20 ft. overall height. These gates will be installed at Dam No. 5, Mississippi River, near Fountain City, Wisconsin, and will be ready for operation in December, 1934. Special features of these gates will be the forged steel heat treated link type lifting chains, and combination gear shaft and sprocket wheel forged integrally in one piece.

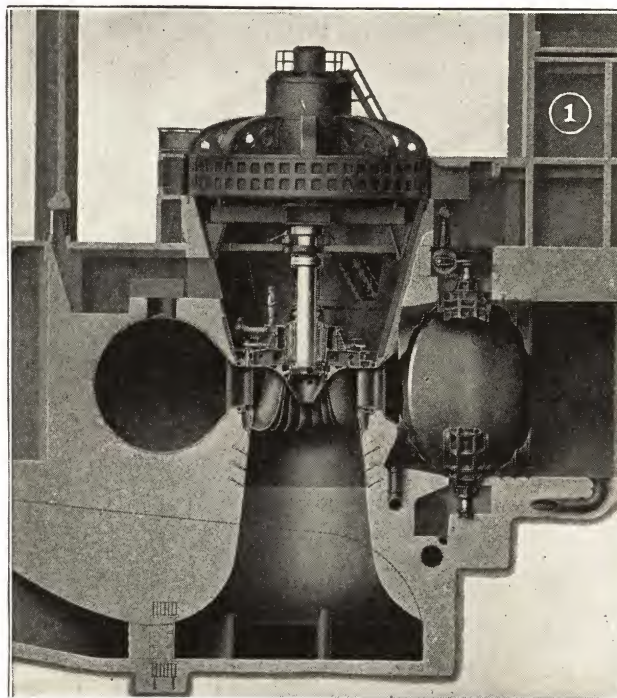


Figure 1 Is a Sectional View through One of the Four 54,000 H.P. 81.8 R.P.M., 89 Ft. Head, Plate Steel Spiral Casing Turbines Built by the Company and Put into Successful Operation in the Conowingo Plant of Susquehanna Power Co. This Sectional View Also Shows One of Four 27 Ft. Diameter Butterfly Valves Designed and Built by the Company and Which Are the Largest Valves of This Type Ever Built

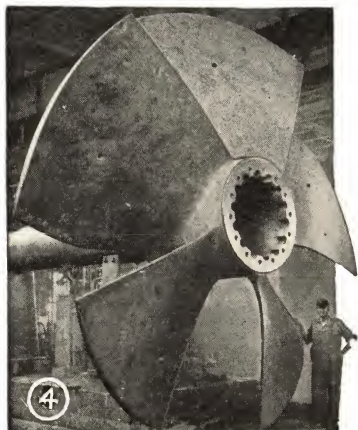


Figure 4, a Propeller Type Runner As Used for Large Capacity Low Head Turbines

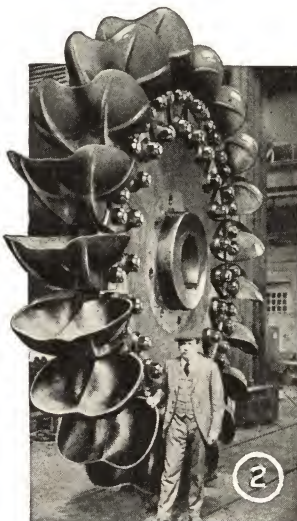


Figure 2 Illustrates a Large Impulse Wheel with Buckets Such As Used in Record Size Impulse Turbines Built by the Company for Heads up to 2500 Ft.

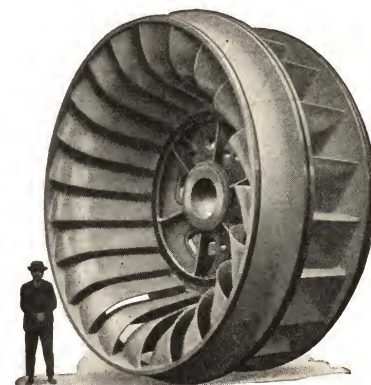


Figure 3 Illustrates a Typical Francis Turbine Runner Such As Built for Large Capacity Francis Turbines for Operation under Medium Heads



# AMERICAN ARCH COMPANY, INC.

64 EAST 42ND ST., NEW YORK, N. Y.

Manufacturers of Air-Cooled Walls and Suspended Arches

Representatives in All Principal Cities

## AMERICAN AIR-COOLED FURNACE WALLS AND SUSPENDED ARCHES For Boilers—Metallurgical Furnaces—Still—Incinerators

**Applications:** American Air-Cooled furnaces and American Suspended Arches are applicable to all types and sizes of boiler furnaces, both stoker and pulverized coal.

American Suspended Arches are also applicable to the various types of industrial heating furnaces, such as continuous heating, annealing, normalizing, open hearth, soaking pit and other steel mill furnaces, glass lehrs, oil stills, etc.; also incinerators.

**Air-Cooled Furnace Walls:** The American Sectionally - Supported Air-Cooled Wall has been designed to meet the requirements of a stable, mechanically strong refractory furnace lining. It prevents infiltration of air into the furnace, eliminates the escape of furnace gases into the air lanes, facilitates the control of CO<sub>2</sub> and assures the maintenance of boiler ratings.

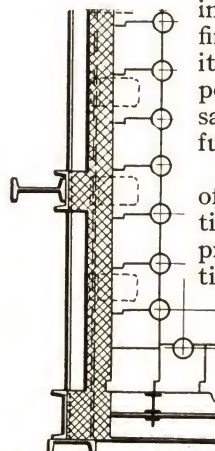
The American Wall construction assures long service with low maintenance costs because of the following features of design:

Supporting castings are not embedded in the tile and consequently do not detract from burning depth of wall.

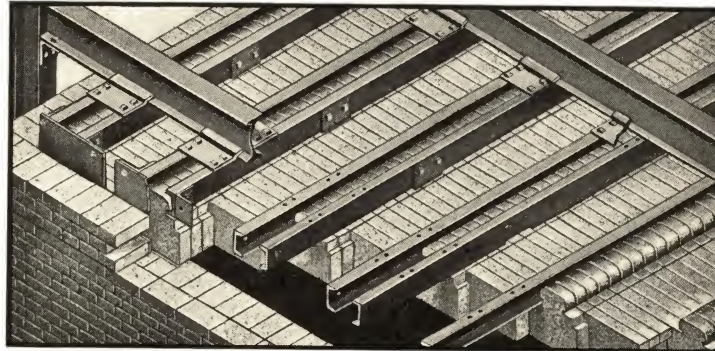
Each section of wall is securely held in alignment and firmly supported at its base, hence no portion of wall can sag or bulge into the furnace.

Sectional method of weight distribution eliminates compression stresses on tile in lower part of wall.

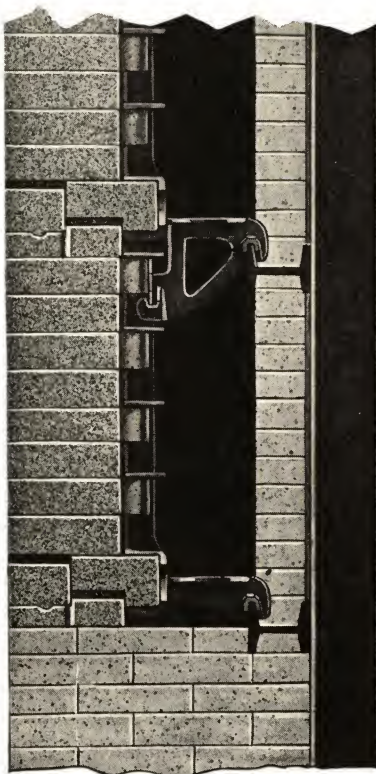
The entire load of each section is supported vertically thus preventing the refractory material from being subjected to shearing stresses.



Waterwall Backing. Sectional View Showing Tubes Fitted into Recessed Tile



American Channel Supported Arch



Section through American Sectionally-Supported, Air-Cooled Wall, Showing the Method Employed for the Suspension of Wall Tile Using Cast Iron Hangers and Retainers, No Metal Being Embedded in Tile

All steel work and supporting castings continuously air-cooled.

Expansion, either horizontally or vertically, can occur without detriment to any part of structure.

**Suspended Arches:** The design of the American Suspended Arch is flexible to an unusual degree, permitting its ready adaptability to any type of furnace. Among the advantages of American Arch design are the following:

The effective tile depth (distance from fire-face to supporting members) is one-third greater than provided in usual designs, adding materially to the life of the arch.

Supporting castings are not embedded in

the tile, and consequently are not subject to overheating.

Outside method of suspension provides easy access for maintenance and repairs from outside of furnace and permits all members of supporting structure to be continuously air-cooled.

Shiplap design of tile prevents any possibility of air or gas leakage between tile joints.

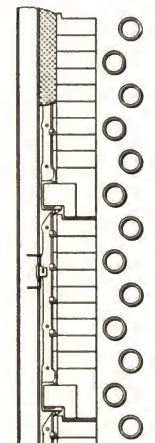
The design and method of suspension of the nose or fan-tail assure long life to this vital part of the arch which is subject to the most severe conditions of service.

**Insulation:** American arches and walls are especially adaptable for the application of insulation wherever the design of the furnace requires retention of heat, such as in heat treating furnaces, oil stills, water wall backing, etc.

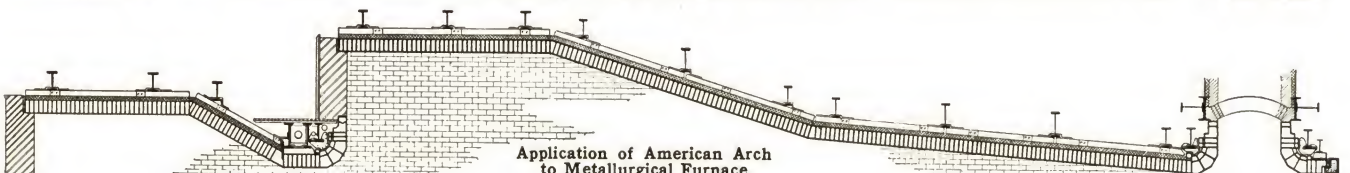
### LITERATURE:

A 48-page book (*Bulletin No. 151*)—Modern Furnace Design—will be sent without obligation to those interested.

*Bulletin No. 161* shows recent applications of American Sectionally-Supported Walls.



Insulated Wall. Insulation Is Used Behind the Refractory Tile to Prevent Radiation Losses



Application of American Arch to Metallurgical Furnace



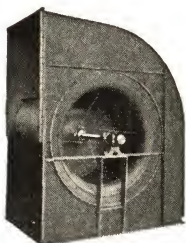
# AMERICAN BLOWER CORPORATION

Division of American Radiator and Standard Sanitary Corporation

6000 RUSSELL ST., DETROIT, MICHIGAN

Branches in Principal Cities

Manufacturers of Air Conditioning, Heating, Ventilating, Cooling, Purifying, Humidifying, Dehumidifying, Drying, Mechanical Draft and Dust Collection Equipment; Vertical Self-Oiling Steam Engines; Fans and Blowers for All Purposes



"Sirocco" Fan

## "SIROCCO" FANS:

The standard wherever fans are required for heating, ventilating, cooling, air conditioning, drying, mine ventilation and exhaust systems.

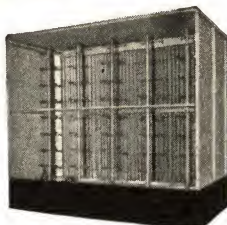
High volumetric and mechanical efficiency. Driven by belt, steam engine, motor or turbine. 30 to 400,000 CFM. *Bulletin A-501.*



Chilled or decolorated water is produced by a well known physical law—water under high vacuum will vaporize at low temperatures. To produce evaporation, the sensible heat of the liquid is given up in the form of latent heat in the vapor. Chilling of the liquid is consequent to this conversion of heat. Water is chilled in a Decolorator by the maintenance of a high vacuum in a vessel into which the water is sprayed. Condensers of the power plant type operating in conjunction with highly efficient steam ejectors produce the vacuum. *Bulletin 2927.*

## "SIROCCO" DEHUMIDIFIERS:

For purifying, cooling, humidifying and dehumidifying air in all classes of buildings in various manufacturing processes and for supplying the air blast for cooling generators, motors and transformers. Thoroughly cleanses the air of all foreign materials and permits the control of air temperatures and humidities. 5700 to 161,000 CFM. *Bulletin 3523.*



"Sirocco" Dehumidifier

## "SIROCCO" UNIT HEATER:

Built with all the requirements of the ideal industrial heating system in mind—high efficiency, light weight heating element, compactness, dependability, even distribution of heat, economy of installation and operation, accessibility of parts, ease of control. For a given size and tip speed the Sirocco Unit Heater delivers more heated air than any other unit of which we know. Made in 28 sizes and capacities to fit every requirement. *Bulletin 8818.*



"Sirocco" Unit Heater

## VENTURAFIN UNIT HEATERS:

For use in modern industrial buildings, stores, garages, etc., and designed to keep the heat in working areas where it is needed.

Venturafin Units are adaptable to High, Medium or Low Pressure Steam Applications—for floor, wall or ceiling installation. Venturafin Units are easy to install—economical to operate and maintain.

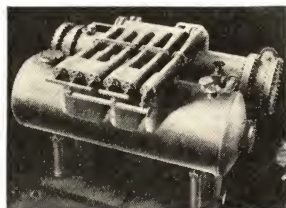
*Bulletin A-3718.*



Venturafin Unit Heater

## DECALORATORS:

Decalorators, steam vacuum refrigerating units, are used for air conditioning and process work in industries requiring chilled water at temperatures from 35° to 60° F. The action of a Decalorator is as follows:

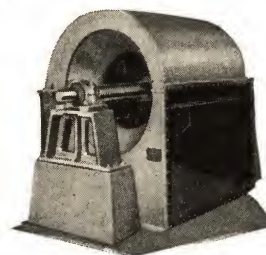


Decalorator

## MECHANICAL DRAFT AND DUST COLLECTOR EQUIPMENT:

American Blower manufactures all types of mechanical draft apparatus, including high speed forced draft blowers for direct connection to motor or turbines, slow speed blowers for belt, reduction gear or engine drive, Multiblade Sirocco fans for induced draft and forced draft, special high pressure fans for the modern high rating boilers and Sirocco Flue Dust Collectors for removing fine ash from the exhaust gases of either powdered fuel or stoker fired furnaces.

All of this material is of extra heavy construction for power plant use, and is designed for the highest operating efficiencies as worked out through our extensive research facilities. *Bulletin 24—Series 3 Dust Collector—Bulletin 1724.*



American  
H. S. Forced Draft Blower



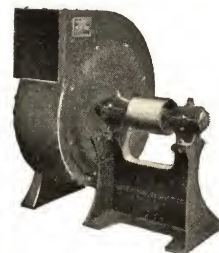
"Sirocco" Dust Collector

## EXHAUST FANS AND PRESSURE BLOWERS:

These are manufactured in a number of different types to meet varying requirements.

Exhaust Fans remove refuse and waste of all kinds and are also used for conveying.

Blowers supply air blast to forges, furnaces and cupolas; sintering, smelting and pulverized coal machines; also used for blowing scale from dies, or other duties requiring air at pressures up to 1½ lbs. Have many advantages over blowing engines or rotary blowers, and furnish air as needed at nearly constant pressure. Types for high and low speed with capacities up to 75,000 CFM. *Bulletin 4406.*



Steel Plate Exhaust Fan, Type "E". One of the Several Types for Various Applications

## CATALOGS AND BULLETINS:

Supplied on request.



# THE AMERICAN BRASS COMPANY

GENERAL OFFICES: WATERBURY, CONNECTICUT

## MANUFACTURING PLANTS

ANSONIA, CONN.

TORRINGTON, CONN.

WATERBURY, CONN.

BUFFALO, N. Y.

DETROIT, MICH.

KENOSHA, WIS.

Canadian Mill: ANACONDA AMERICAN BRASS LIMITED, NEW TORONTO, ONTARIO

### ANACONDA PRODUCTS:

Anaconda Copper and Brass products include all combinations of Copper, Zinc, Lead, Tin and Nickel that can be wrought into sheets, wire, rods and tubes.

The service of an efficient Technical Department, the knowledge and experience of which is based on a century of brass manufacturing, is available to those confronted with metal problems.

### SPECIAL ALLOYS FOR ENGINEERING USES:

For engineering installations requiring metals of uniform high-tensile strength as well as resistance to corrosion, oxidation and wear, special alloys can be supplied in the form of sheets, wire, rods and tubes. These special alloys are successfully utilized in manufacturing coal-screen plates, condenser-tube plates, disc valves for pumps, diaphragms, plates and bolts for filtration plants, pump piston rods and plungers, valve stems, linings for hydraulic cylinders, welding and brazing stock, magneto parts, marine instruments, etc.

**Ambrac Metal (Trade-mark Reg. U. S. Pat. Off.):** A special copper-nickel alloy made exclusively by The American Brass Company; for use in mechanical and chemical construction where maximum strength and resistance to the corrosive action of alkalis, hot gases, dilute acids, saline solutions and high temperatures are essential. Ambrac is furnished in the form of sheets, wire, rods and tubes.

**Everdur (Trade-mark Reg. U. S. Pat. Off.):** Everdur is nearly all copper, hardened and strengthened by alloying in accordance with special formulae. Attention is called to the strength and high physical qualities of the metal, which make it possible to replace steel used under corrosive conditions with Everdur to engineering advantage and with ultimate economy.

Everdur Metal is manufactured exclusively by The American Brass Company in the form of plates, sheets, rods, wire, pipe, hot pressed parts, forging blanks, rivets and casting ingots.

**Phosphor Bronze:** Phosphor Bronze is an alloy of high tensile strength, toughness and elasticity, highly resistant to corrosion, wear and fatigue.

Anaconda Phosphor Bronze is manufactured in various grades, containing from 4% to 10% tin, including a special free turning alloy rod developed for automatic screw machine production.

**Tobin Bronze (Trade-mark Reg. U. S. Pat. Off.):** Tobin Bronze is manufactured solely by The American Brass Company. It combines elasticity, toughness and uniformity of texture with remarkable resistance to corrosion. This makes it particularly adaptable for a great variety of engineering uses, especially where the material is subjected to the corrosive action of salt water.

Tobin Bronze is furnished in rods and special shapes, turned and straightened pump piston rods and boat shafting; hot rolled sheets; circles for condenser head plates.

**Anaconda Beryllium Copper (A Heat Treatable Copper Alloy):** Anaconda Beryllium Copper is a new alloy, produced in wrought commercial forms, which possesses excellent physical properties which *may be greatly increased by heat treatment*. This makes it possible to fabricate the alloys in an annealed or cold



worked state and to harden and strengthen the finished product by subsequent heat treatment; resulting in a very high tensile strength and fatigue limit values. Its electrical and thermal conductivities are relatively high and its corrosion resistance is comparable to that of copper. See *Anaconda Pub. B-21*.

### WELDING RODS:

The American Brass Company manufactures Welding Rods of Tobin Bronze, Everdur, Manganese Bronze, Phosphor Bronze, Brazing Metal, Naval Bronze, Silicon Copper and Electrolytic Copper.

Tobin Bronze is the most satisfactory rod for the general Oxy-Acetylene welding of cast iron. It melts at 1625°F. and flows freely at 1650°F., making joints stronger than cast iron.

### SPECIAL SHAPES FOR ENGINEERING USES:

Extruded, Drawn and Rolled Shapes of accurate cross section are produced in an unlimited number of designs. These shapes . . . remarkably homogeneous, free from defects and physically superior to sand castings . . . reduce rejections, require very little machining and minimize scrap losses.

### DIE PRESSED OR HOT FORGED PARTS:

Anaconda Die Pressed Metals are made in a wide variety of shapes from Brass and Bronze alloys as well as from Leaded Nickel Silver. The use of extruded blanks of proper cubic measurement as a base insures maximum density and freedom from blow-holes or spills. Die pressed parts are stronger than sand castings and require little, if any, machining.

### TUBES FOR ENGINEERING PURPOSES:

The facilities of the company include equipment for the production of round seamless tubes in sizes up to 26 inches I. D. in a wide range of alloys. Also square and special cross-section tubes in various sizes.

**Anaconda Condenser Tubes:** Anaconda Condenser Tubes are manufactured in all standard sizes of the following alloys: Super-Nickel (70% Copper, 30% Nickel), Ambrac "A" (75% Copper, 20% Nickel, 5% Zinc), Aluminum Bronze (95% Copper, 5% Aluminum), Aluminum Brass (76% Copper, 22% Zinc, 2% Tin), Admiralty Alloy and Muntz Metal. Super-Nickel, Ambrac and Aluminum Bronze, produced by the new extrusion-rolling-drawing process are recommended for both stationary and marine condensers operating under unusually severe conditions.

**Anaconda Deoxidized Copper Tubes:** Anaconda Seamless Copper Tubes are made from specially deoxidized copper and are free from cuprous oxide inclusions so detrimental to the life of ordinary copper tubes.

**Fittings:** The American Brass Company now offers Cast Bronze Fittings of both "Solder" and "Flared Tube" types for use with Anaconda Copper Tubes.

**Anaconda 67 Brass and 85 Red-Brass Pipe:** The American Brass Company offers Anaconda 67 Brass Pipe for use with normally corrosive waters and Anaconda 85 Red-Brass Pipe for use with highly corrosive waters. Extensive laboratory research, confirmed by the perfect condition of installations after 9 to 18 years in localities where iron fails rapidly, shows that Anaconda 85 Red-Brass is the highest quality corrosion-resisting pipe commercially obtainable at moderate cost.



## AMERICAN CABLE COMPANY, INC.

An Associate Company of the American Chain Company, Incorporated

WILKES-BARRE, PENNSYLVANIA

Manufacturers of Wire Rope and Fittings

DISTRICT OFFICES

ATLANTA      CHICAGO      DENVER      DETROIT      NEW YORK  
PHILADELPHIA      PITTSBURGH      SAN FRANCISCO      HOUSTON

### PRODUCTS

Tru-Lay Preformed Wire Rope.  
Crescent (*non*-preformed) Wire Rope.  
Tru-Lay and Crescent Wire Rope Slings.  
Wire Rope Fittings, Hooks, Sockets, Thimbles, etc.  
Tru-Loc Wire Rope Processed Fittings.

### TRU-LAY PREFORMED WIRE ROPE

Tru-Lay Preformed Wire Rope is the result of a manufacturing process, insuring longer life. It is made in all sizes, grades, constructions and lays. In Tru-Lay Preformed Wire Rope, wires and strands are shaped to the exact form they assume in the completed rope. Preforming removes internal tension because wires and strands lie side by side naturally—without straightening-out tendencies.



Note the Helical Shape of the Wires and Strands

The above illustration was made from an actual photograph. You can unwind a strand from Tru-Lay Preformed Wire Rope, and you can unwind a wire from the strand exactly as shown above. Both wire and strand fit perfectly in position again.

Tru-Lay Preformed Wire Rope resists kinking, high and low stranding and is easier to handle. Tru-Lay resists rotating in drawn grooves. Thus Tru-Lay gives much longer service over non-preformed rope of the same grade and construction.



The above illustration of Tru-Lay Preformed Wire Rope was also made from an actual photograph. Note that it is not necessary to seize the end, because the strands and wires lie in position without internal tension. With wire rope that is *not* preformed, the strands and wires straighten out and unravel when cut unless the end is firmly seized with several wrappings of wire.

### CRESCENT WIRE ROPE

Crescent Wire Rope is *not* preformed and is recommended in instances where operating conditions are such that preformed wire is not necessary. Our many years of experience with both types of wire rope enable us to make the proper recommendations.

### SLINGS, FITTINGS, HOOKS, SOCKETS AND THIMBLES

Send for Catalogue for full particulars about AMERICAN CABLE COMPANY'S Wire Rope Slings and Wire Rope Fittings.

### LITERATURE

Literature and prices covering all types of Tru-Lay Preformed Wire Rope, Crescent Wire Rope, Tru-Loc Fittings, Regular Wire Rope Fittings and Slings furnished on request.

## AMERICAN SCREW COMPANY

PROVIDENCE, RHODE ISLAND

WESTERN OFFICE: 219 W. Randolph St., CHICAGO, ILL.

Makers of Wood Screws, Machine Screws, Stove Bolts, and Tire Bolts

### PHILLIPS RECESSED SELF CENTERING SCREW

The Phillips *recessed, self-centering* screw is the most important fundamental improvement in screw design since the pointed screw was introduced by this company 75 years ago.



The Phillips screw employs the principle of a tapered recess in the head which exactly fits a tapered driver. This simple but basic patented feature avoids the weaknesses of the ordinary type of screw and screw-driver and accomplishes many far-reaching improvements.

#### Advantages of The Phillips Screw



1. The screw-driver automatically finds the center of the screw head, permitting faster, positive starting, making it easy to guide the screw and drive it straight.
2. The driver will not slip out of the socket or work to one side.
3. The Phillips screw has more than three times as much gripping area as the slotted screw. This gives greatly increased strength and torsion with the result that Phillips screws can be driven into material which slot head screws will not penetrate.
4. The Phillips screw holds on the point of the driver in any position. Screws can be inserted with one hand.
5. Tests with both hand and power drivers prove that more than 100% increase in the number of screws which can be inserted in a given time is a low estimate.
6. Two sizes of drivers fit all screw sizes from No. 5 to No. 16, inclusive.
7. Phillips screws will not mar wood or metal while being driven or countersunk as the driver cannot slip out or to one side.
8. Phillips screws can be removed or replaced many times without marring the head.
9. Very little down pressure is required to hold Phillips drivers in the screws. They drive true and straight with less effort.

The Phillips screw is the perfected result of a sound theory to which the most meticulous studies of mechanical principles and angles have been applied. Thoroughly tested, this new type screw is now offered by the world's largest and longest established (1838) screw maker who also manufactures drive screws tire bolts, machine screws, stove bolts and stove rods.

It carries a large stock, ready for immediate delivery, comprising, in addition to the varieties commonly in demand, a large assortment of varieties less frequently called for and often difficult to obtain elsewhere.

Catalogue showing exact range of sizes and other pertinent information, as well as list prices, will be sent upon application.



# AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS  
NORTH TONAWANDA, N. Y.

*Manufacturers of ADSCO Steam Line Equipment*

Over 50 Years in Business

Branches and Sales Offices in Principal Cities

## STEAM DISTRIBUTION EQUIPMENT

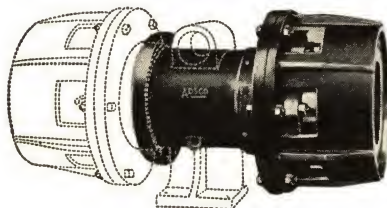
The American District Steam Company manufactures a most complete line of Expansion Joints and Variators (Packless Expansion Joints), also Condensation Meters, Steam Flow Meters, Instantaneous Water Heaters, Storage Water Heaters, Steam Traps, Strainers, Separators, Pressure Reducing Valves, Vapor Heating Specialties, Underground Steam Line Conduit and Insulation, Pipe Alignment Guides, Roller Pipe Guides, Insulation Supports, Insulation Protectors, Pipe Anchors, etc. The quality of these products is manifest in the fact that ADSCO equipment is used in more than 90 percent of the country's District Heating projects. The records of service on these installations commend the use of these devices on every steam distribution system that must perform efficiently and economically over a long period of time.

## ADSCO SLIP-TYPE EXPANSION JOINTS

Made in a complete range of sizes and types for all pressures to 400 lbs. per square inch and temperatures to 750 degrees Fahrenheit. We shall be glad to furnish complete information on the types of joints illustrated as well as all others which we manufacture.

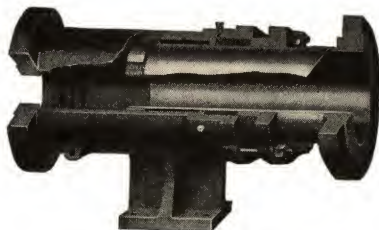
Practically every type is made in both single and double slip with or without anchor base, and with or without service connection. Special joints are also furnished for special conditions to meet peculiar or unusual installation requirements.

### ADSCO Externally Guided Joint



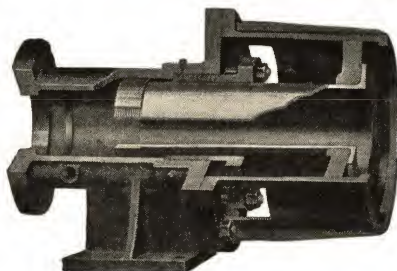
Of heavy rigid construction, with the guiding feature obtained through the use of the external guide hood. The gland is easily accessible for inspection and adjustment.

### ADSCO Internally Guided Joint



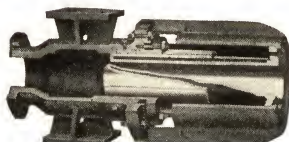
The unique internal guide provides full guiding at all times. Largest diameter of joint is smaller than the flanges. Limit stops prevent excess slip travel. Joint recommended for use in restricted spaces. No moving metal contact against polished surface of slip.

### ADSCO Internally-Externally Guided Joint



Slip is guided both internally and externally, incorporating all the features of the internally guided type of joint and the externally guided joint. Slip is always guided at extreme ends throughout entire length of travel. There is no contact of the sliding surface of the slip with other metal parts.

### ADSCO Duplex-Sleeve Joint



Featuring the air-insulated slip, which reduces heat transmission to the packing 25% to 45% according to tests made at Carnegie Institute of Technology. Long service from packing is assured. The outstanding joint for high temperature work.

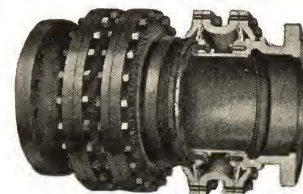
## ADSCO ROTARY CONDENSATION METER



For metering the steam consumption of heating systems and equipment of all kinds in which steam is condensed, and for metering various liquids in industrial processes. Guaranteed accurate within 1% to 150% of rated capacity. Reads directly in pounds. All working parts made of non-corrosive metals. Patented Adjustable Nozzle permits compensating for unusual installation conditions and mechanical wear. Furnished in seven sizes, ranging from 250 lbs. to 12,000 lbs. per hour capacity. Case and cover are made of cast iron or aluminum, as desired.

## ADSCO VARIATOR (Packless Expansion Joint)

A time-proved, dependable packless expansion joint in a complete range of sizes, 3" to 20", inclusive, for all pressures to 400 lbs. per square inch and temperatures to 750 degrees Fahrenheit. Basic principle in use for more than 40 years. Thousands of ADSCO Variators are in service today, many of the low pressure devices having been installed more than thirty years ago. The ADSCO High Pressure Multiple Diaphragm Variator is illustrated. It is recommended for use on high pressure, high temperature lines where complete freedom from leakage and maintenance is essential during the entire life of the installation.



## LITERATURE SUPPLIED ON REQUEST

Write for complete ADSCO Catalog on Expansion Devices, Condensation Meters and other products.



# AMERICAN ENGINEERING COMPANY

2412 ARAMINGO AVE., PHILADELPHIA, PA.

*Manufacturers of Power Plant and Material Handling Equipment*

Offices in Principal Cities

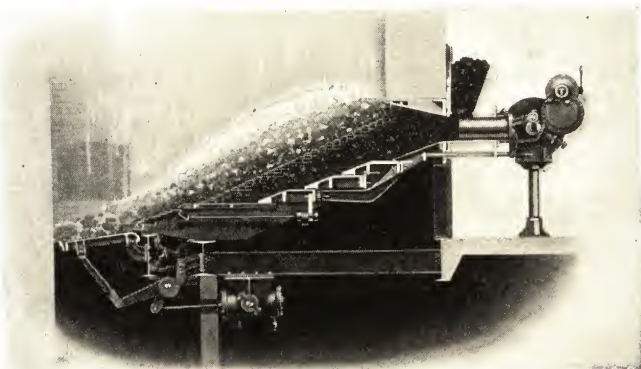
CANADA: Affiliated Engineering Corporations, Ltd., MONTREAL, QUE.

GREAT BRITAIN: Taylor Stoker Co., Great Smith St., Westminster, LONDON, S. W. I.

## THE TAYLOR STOKER:

**Design:** The Taylor Stoker is of the inclined multiple retort underfeed type and the first Taylor was the original stoker of this type.

It consists of a stationary tuyère structure, between the sections of which are set ram boxes containing cylindrical feeding rams and a series of distributing pushers forming the bottom of each retort. The stroke of each pusher can be adjusted independently. This individual adjustment gives throughout every portion of the retort the exact feeding of fuel required to meet the burning characteristics of the particular fuel being used.



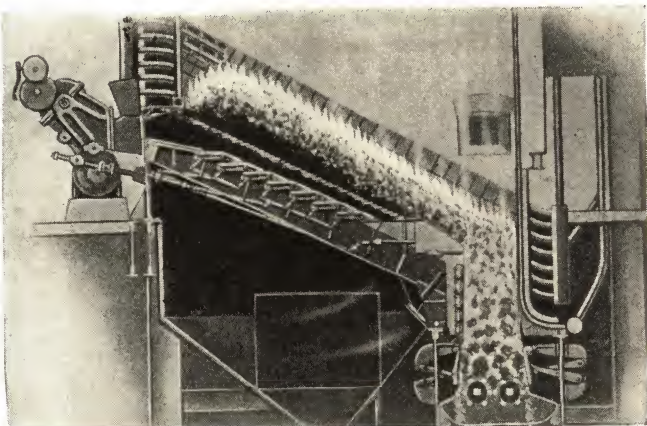
Cross-Section of the Taylor Stoker with Steam Dump Ash Discharge Showing the Deep Compact Fuel Bed

The action of the pushers also keeps the fuel bed clean throughout the retort area, exerting a gentle slicing action which prevents clinker formations and stimulates combustion.

A reciprocating extension grate is provided, to which air is furnished at low pressure for burning out the fixed carbon remaining in the ash after it has passed beyond the tuyère structure.

The Taylor Stoker can be operated by steam turbine, engine, electric motor or electro-hydraulic drives.

The stoker is equipped with a two-speed spur gear power box giving a high transmission efficiency. Speed changes are made without gear shifting.



Cross-Section of Taylor Stoker with Rotary Crusher Ash Discharge

The Taylor Stoker is supplied with either steam Dump Ash Discharge or Rotary Crusher Ash Discharge, depending on plant conditions and requirements.

**Capacity:** The Taylor Stoker is built for fuel burning rates from 200 lbs. to 5000 lbs. per retort per hour. The arrangement of auxiliary pushers lends itself especially to the design of long stokers. The largest stokers ever built are Taylors and a stoker of any length and width to meet any steam requirement can be built.

Normal operation with a 20 to 1 steaming range is common practice in Taylor Stokered plants.



TRADE-MARK

## "LO-HED" MONORAIL ELECTRIC HOIST:

*"The Electric Hoist that operates in the Minimum Headroom."*

**Capacities and Types:** 500 lbs. to 24,000 lbs. The "Lo-Hed" is made in types for every variety of service

within the limits of its capacity. For alternating or direct current. Without trolley, floor operated; plain trolley, floor operated; hand geared trolley, floor operated; motor driven trolley, floor operated; motor driven trolley, cab control, for indoor or outdoor service.

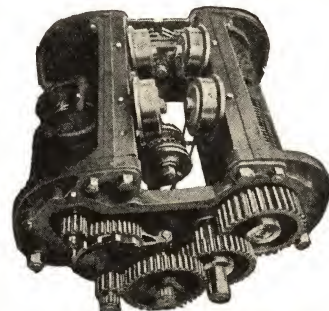
**Design:** The ¼-ton hoist is fully enclosed in a pressed steel frame. Hoists of greater capacity are designed with the drum and motor on opposite sides of, and parallel to, the I-beam rail. This exclusive feature of design makes it possible to draw the load block up between the drum and motor into the body of the hoist and enables the hoist to operate in the absolute minimum headroom.

Lowering brake ratchet and pawl and the gears are of steel, drop-forged; pinions and shafts are of high carbon steel; hoisting cable is of improved plow steel of highest tensile strength.

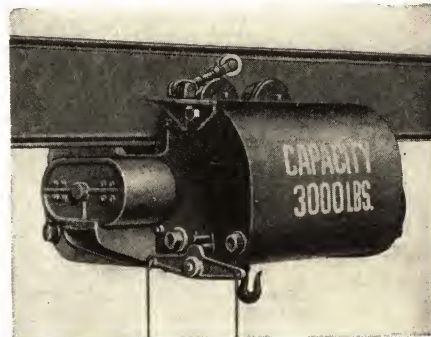
**Efficiency:** High mechanical efficiency is insured by the use of Hyatt high duty roller bearings on ends of gear shafts and in trolley wheels; the operation of all gears and main bearings in an oil bath; the lubrication of other bearings by means of the alemite high pressure system; and the use of the straight spur gear drive and ball bearing motor.

**Safety:** All "Lo-Hed" Hoists have a factor of safety of 5 on all parts, and are equipped with an automatic, fool-proof upper limit switch.

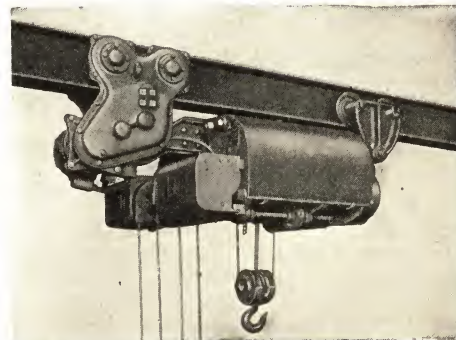
**Accessibility:** By simply removing the outside metal covers all working parts of the "Lo-Hed" can be easily inspected or removed.



Top View "Lo-Hed" Hoist with Covers Removed. Note Simplicity and Accessibility of the Remarkably Small Number of Operating Parts



"Lo-Hed" Plain Trolley Hoist



"Lo-Hed" Motor Driven Trolley Hoist

## QUARTER TON

### "LO-HED":

A high speed electric hoist that weighs 200 lbs., pressed steel frame, push button control, ball bearings, oil bath lubrication, all working parts enclosed, gearing and shafts of drop-forged, heat-treated, chrome-manganese steel, drop-forged steel hook, heavy duty mechanical load brake, automatic electric brake—these are only a few of its many desirable features.



## AMERICAN MANGANESE BRONZE COMPANY

*Metallurgical Engineers and Founders*

MAIN OFFICE AND WORKS  
HOLMESBURG, PHILADELPHIA, PA.

*Producers of Bronzes for Engineering Purposes*

### PRODUCTS

Bronze Castings of every kind; bronze forgings and hot-rolled rods and bars. Specialize on high test metals and large castings.

**HY-TEN-SL**  
A Bronze as Strong as Nickel Steel

SAND CAST, FORGED, HOT ROLLED, CENTRIFUGALLY CAST

For great strength both in tension and compression.  
Ult. Tensile Strength..... 85,000 to 120,000 lbs. per sq. in.  
Yield Pt..... 40,000 to 70,000 lbs. per sq. in.  
Elongation..... 25% to 8% in 2".

#### Some Uses for Hy-Ten-Sl Bronze:

Bearings (Heavy Duty)—Bridge Expansion Tracks and Shoes—Thrust and Trunnion Bearings—Turn Table Discs—Gears (Spur, Bevel, Worm)—Screw-Down Nuts for Rolling and Bending Rolls—Hydraulic Press Parts—Lifting Nuts—Hydraulic Pressure Castings—Valve Seats (Pumps and Compressors)—Valve Stems—Pump Bodies—Pump Impellers—Aeroplane Parts—Centrifugal Baskets—Jordan Knives—Shaft Sleeves—Boat Shafting—Corrugated Paper Rolls—Tube Heads on Heat Exchangers—Rotor Rings for Generators—Canal Lock Operating Parts.

*Send for Hy-Ten-Sl Bronze folder.*

### RESISTAC

For Acid Resisting, sulphuric acid and others.

### ALUMINUM BRONZE

For resistance to shock, high temperature and chemical corrosion. Alum Bronze No. 3 contains nickel. When heat-treated it becomes very hard and will test.

100,000 to 150,000.....	Tensile Strength
200 to 360.....	Brinell Hardness

### EVERBRITE

A cupro-nickel casting alloy for superheated steam and other high temperature service. Resists fruit and vegetable acids.

#### Characteristics

Strength at high temperatures  
Resistance to steam and gas erosion  
Corrosion Resistance  
Sound Castings

#### Guaranteed Minimum Tests

Ult. Tensile Strength.....	75,000 lb. per sq. in.
Yield Point.....	50,000 lb. per sq. in.
Elongation.....	14% in 2".
Hardness, Brinell.....	170

### TURBINE METAL

For resistance to hydraulic erosion, in turbine runners, pump runners, etc.

80,000 lbs.....	Tensile Strength
20%.....	Elongation

### OTHER ALLOYS

Aluminum	Copper	Everdur
Lead	Monel	Nickel
Manganese Bronze	Phosphor Bronze	Silicon Bronze
Corrosion Resisting Alloys		

### FACILITIES

Our Foundry is equipped for heavy work and alloys of high test. It is one of the largest Bronze Foundries on the continent, and is equipped with the latest type of melting furnaces, giving us a total melting capacity of 40 tons per day.

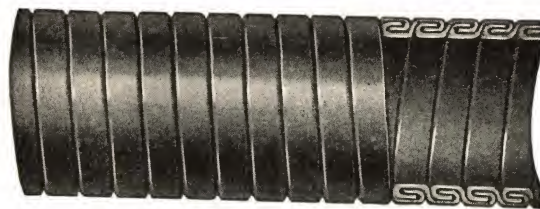
We have made single castings weighing 50,000 lbs.

We are equipped with a pattern shop, laboratory and testing apparatus. All work is done under careful technical control. Engineering service is offered with all our products.

## ATLANTIC METAL HOSE CO.

Incorporated

111 W. 64TH STREET, NEW YORK, N. Y.



Type B. D. 15 Steel or Bronze

### ATLANTIC FLEXIBLE METAL HOSE

Atlantic Flexible Metal Hose, made of Galvanized Steel or Bronze, 4-Wall Interlocking construction, in all commercial sizes; is especially adapted for engineering and mechanical purposes. It has no equal as a flexible conveyor of oils, live steam, acids, alcohol, exhaust, vacuum, etc.

**For Steam:** Atlantic Flexible Metal Hose cannot vulcanize and become hard and brittle and then burst—as is the case with rubber hose. It is also constructed to resist any possible pressure.

**For Oil, Tar, Asphalt:** Atlantic Flexible Metal Hose is not harmed by the action of oil, tar, heat, etc. As a matter of fact, its life is lengthened when used for oil. It cannot dissolve and does not kink.

**For Suction:** Atlantic Flexible Metal Hose is especially adapted for this class of work as it cannot kink or collapse, and it is not affected by rubbing or friction on the outside.



### ATLANTIC SEAMLESS FLEXIBLE METAL HOSE

Jointless—No Locks or Packing—Made in Steel and Bronze

Seamless Flexible Metal Hose is made from solid drawn metal tube, Steel or Bronze; is absolutely Seamless; has no packed or sliding joints; is ideal for many engineering and mechanical purposes; is extremely flexible and is recommended for conveying compressed air, gasoline, steam, gases, chemicals, oils, exhaust, etc.

**Couplings:** Couplings are attached to hose in two ways, soldered or packed on. For steam and hot liquids couplings are packed on with asbestos and red lead. For all other purposes couplings are soldered on. All couplings are with standard iron pipe threads. Special couplings or flanges can also be furnished on application or to blueprint.



### SEAMLESS WELDED STEEL HOSE

Supplied in all commercial sizes, straight or bent. Ideal for Diesel Engine Exhaust. Furnished complete with standard floating type flanges brazed on.



# THE AMERICAN METAL HOSE COMPANY

## WATERBURY, CONNECTICUT

### SALES OFFICES AND AGENCIES

NEW YORK CITY . . . 25 Broadway

SAN FRANCISCO, CAL. . . (Pacific Coast)  
F. Somers Peterson Co.

CHICAGO, ILL. 1326 W. Washington Blvd.

CANADA: Lytle Engineering Specialties, Limited, MONTREAL, CANADA

### AMERICAN FLEXIBLE METAL HOSE:

**Material and Uses:** There are two broad classifications of American Flexible Metal Hose: (1) That constructed from a continuous metal strip which is first profiled into the desired shape and then spirally wound over itself; (2) That formed from chasing a deep, continuous groove in a piece of seamless, drawn tubing. In each of these classifications various types of hose have been developed to meet specific conditions.

A large percentage of hose problems results from the use of hose unsuited to the work in question, or to suitable hose being incorrectly installed. The American Metal Hose Company has for twenty-three years specialized in the manufacture of flexible metal hose and in every case aims to provide the one type of hose best suited to specific requirements. A technical department, maintained for the purpose, offers its service and experience in the solution of hose problems.

American Flexible Metal Hose, while applicable to all purposes for which hose is used, is primarily a heavy service hose suitable for the most severe classes of work as well as for service where chemical action or intense heat limits the life of rubber hose. The most popular and widely used styles of American Flexible Metal Hose are described below.

Catalogues and literature giving details on flexible Vacuum Hose, Carburetor Tubing, Heater Tubing, Exhaust Tubing, Conduit, Suction and Blower Hose, etc., are available for your files. Our large catalogue on Flexible Metal Hose, Tubing and Conduit for all kinds of industrial machinery and plant uses, will be sent upon request.

**Steam Hose:** American Flexible Bronze Hose (Types BD15 and BD20) for steam. For normal services and pressures, the BD15 or unbraided interlocked bronze hose is used. For services where the hose is

subjected to high pressures, constant bending or rough handling, BD20 (wire braided) hose is recommended on account of its greater strength. In case the steam is superheated, a galvanized steel hose is preferable to the bronze. Flexible Metallic Steam Hose easily withstands the effects of heat, moisture, and high pressures. It will not vulcanize or crack. I.P.T. couplings corresponding to the inside diameter of the hose are threaded onto the profile of the hose and made tight with a "stuff-



BD15 Type of Hose  
Unbraided, Interlocked  
Steel or Bronze  
Size  $\frac{1}{2}$  to 8 In.  
Inside Diameter, Inclusive



BD20 Type of Hose  
Steel or Bronze Braided  
Size  $\frac{1}{2}$  to 1  $\frac{1}{4}$  In.  
Inside Diameter, Inclusive

ing box" of asbestos and boiler cement. They cannot blow off. Among the more common uses for Flexible Metallic Steam Hose are blowing out boiler flues and for steam heating tank cars prior to unloading.

**Oil Hose:** American Flexible Galvanized Steel Hose (Types BD15 and BD20) for oil. As in the case of steam hose, BD15 or unbraided hose is recommended for normal services and pressures, and BD20 or braided hose for hard services and high pressures. Oil hose couplings carry a pipe thread corresponding to the inside diameter of the hose and as a general rule are attached with solder. Oils have a beneficial rather than a deteriorating effect on flexible steel oil hose as they lubricate the joints, insuring the maximum of flexibility and also act as an additional rust preventative. A few of the best known uses for flexible steel oil hose are as flexible lubrication lines, conveying oils and cutting compounds, and unloading tank cars. On tank car unloading hose, a 45° elbow coupling, threaded to fit the special thread on tank car outlets, is soldered to one end of the hose and a swivel female iron pipe thread coupling to fit the outlet of the storage tank is soldered to the other end.

### AMERICAN SEAMLESS FLEXIBLE TUBING:

Formed from a seamless drawn solid tube into which helical corrugations or grooves are machined to impart the necessary flexibility. It is a radically new development, a new and improved type of flexible metal hose that is resilient, unusually flexible, and of such strength as to permit its use for conveying oil, air, steam, ammonia, penetrative gases and volatile liquids at considerable pressures. Due to its construction and the absence of joints, seams, welds or brazes, it is absolutely leak-proof and airtight. Tubing is usually fabricated from a special high copper content alloy or from steel, but various other alloys can be used when substance to be conveyed would be injurious to these metals. Entirely suitable for moderate pressures without any outside covering. For extremely high pressures, it can be reinforced by one or more braidings of phosphor bronze or galvanized steel wire.



Closed Groove Seamless Flexible Tubing



Open Groove Seamless Flexible Tubing

Couplings for seamless tubing are either of the soldered, packed on-heat-proof, or welded type, depending on temperature and service to be met. We are equipped to furnish fittings for all sizes of tubing with any thread, standard or special, in any of these styles.

Seamless Flexible assemblies are used for conveying liquid ammonia or SO<sub>2</sub> gas in charging and dehydrating refrigerator units; for conveying illuminating gas; for connecting platens on steam heated presses; for oil and gasoline lines on airplanes, motor boats, automobiles, tractors; for hydraulic feeds and speed mechanism on machine tools; and for absorption of shock or impact pressures between moving members of a machine. When protected with two braidings of galvanized steel wire and equipped with packed couplings, American Seamless Flexible Tubing is listed as standard by the Underwriters' Laboratories for oil, gas or air lines on burner equipment. Sizes  $\frac{1}{2}$  to 2 in., inside diameter, inclusive.



# AMERICAN PULVERIZER COMPANY

MAIN OFFICE AND WORKS

1239 MACKLIND AVENUE, ST. LOUIS, MO.

*Manufacturers of Ring and Hammer Crushers, Pulverizers and Shredders*

## SALES AGENCIES

CINCINNATI . . . Chamber of Commerce Bldg.  
NEW YORK . . . . . 51 East 42nd St.  
CHICAGO . . . . . 140 So. Dearborn St.  
CLEVELAND . . . . . 7016 Euclid Ave.

ATLANTA . . . . . 93 Pryor, S. W.  
PITTSBURGH . . . . . 412 Westinghouse Bldg.  
DETROIT . . . . . 7328 Hamilton Ave.  
BIRMINGHAM . . . . . Box 414

## PRODUCTS

**American Ring Crushers, Shredders and Pulverizers** for crushing and grinding all kinds of refractory materials.

Many years of successful service in well-known Central Stations and Manufacturing Plants, etc., have earned for it the endorsement of leading Engineers and Operators. In the crushing and pulverizing field it has established itself as most efficient and economical.

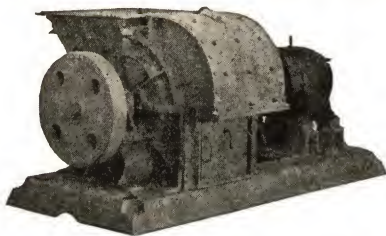
These crushers and pulverizers are unique in design and built upon the Rolling Ring crusher principle of which the American Pulverizer Company is the originator. The flexibility of the Rolling Ring System is the chief reason for the low power consumption and low maintenance cost per ton of finished product.

## COAL CRUSHERS

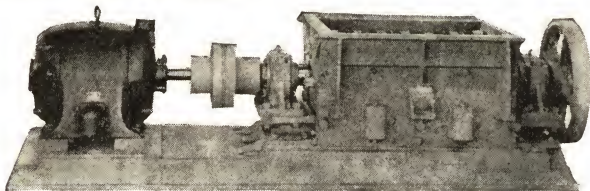
The American Ring Coal Crusher will consistently reduce Run-of-Mine coal to the desired size for Stoker or Pulverized Fuel Equipment. The manganese steel rings "give" and protect the machine from injury by foreign material.

The American Rolling Ring Crusher embodies a number of original features in its operating mechanism,

which makes it the outstanding Coal Crusher. Simplicity and Accessibility were the guiding factors in the American Ring design. These crushers are built in various sizes and types.



Crusher and Motor Direct Connected and Mounted on Heavy Cast Bed Plate. Special Features Metal Trap and Timken Roller Bearings

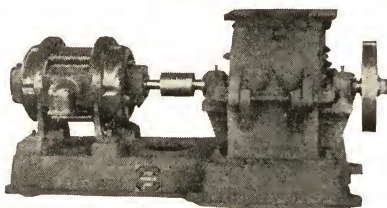


NO. 40-S AMERICAN RING CRUSHER

Timken Roller Bearings. Particularly Suitable for Installation in Tipples Where Headroom Is Limited. Capable of Crushing Bituminous Coal to a Product from 6" to 1" with Minimum of Fines

Heavy, rugged cast steel construction insures an uninterrupted supply of coal uniformly prepared to the desired sizes.

## CHEMICAL MACHINES (Ring or Hammer)

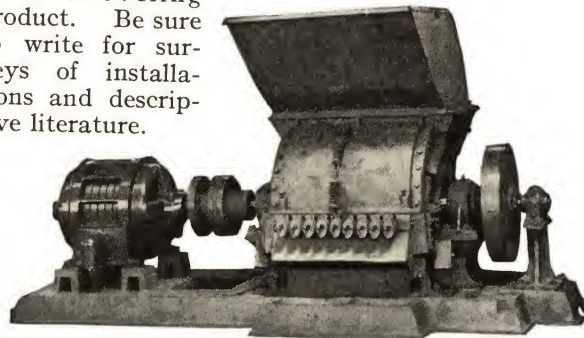


These mills are used for grinding shellac, alum, niter-cake, resin, bones, cracklings, etc.

Note compact design.

## STEEL TURNINGS CRUSHERS

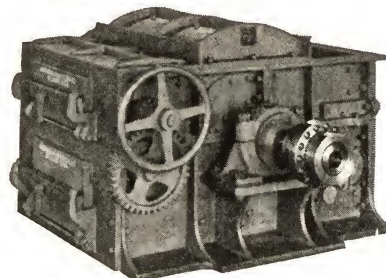
American Ring Steel Turnings Crushers are successfully crushing the long turnings obtained from automatics, lathes, etc., to a shoveling product. Be sure to write for surveys of installations and descriptive literature.



No. 3800 American Ring Steel Turnings Crusher Mounted on Heavy Bed Plate. Flexible Coupling Direct Connected to 100 HP. Motor

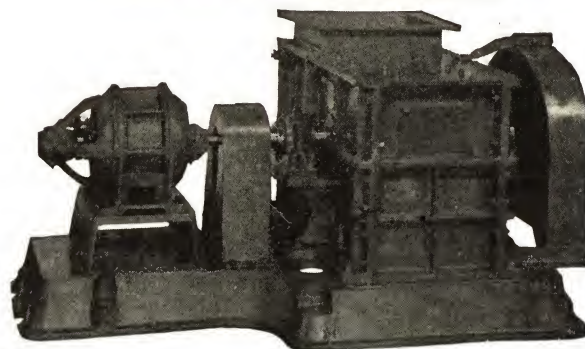
## FINE GRINDERS

The American Pulverizer is used for grinding glass and tank cullet, salt briquettes, sinter, skimmings, limestone, lime, gypsum, oyster shells, phosphate rock and other materials too numerous to mention here.



Adjustable Grinding Plate and Drop Bottom Cage

## HAMMER MILLS AND HOGS



For grinding and shredding all kinds of fibrous materials, such as pulp, wood refuse, roots, asbestos, bark, garbage, tankage, sewage and chemicals. Note rigid and compact construction; SKF bearings, metal trap, alloy steel shaft, liners and sectional construction.

## LITERATURE

Let us know what you intend to grind and we will send you descriptive literature on the type of equipment for your requirements. We maintain a testing plant for prospective users of our equipment.



# AMERICAN STEAM PUMP COMPANY

MAIN OFFICE AND FACTORY: BATTLE CREEK, MICHIGAN

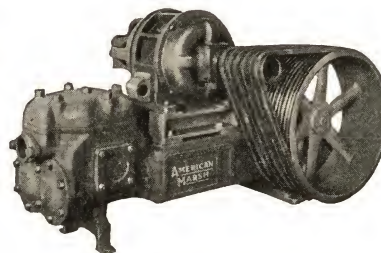
*Manufacturers of Pumps and Pumps only since 1873*

Sales Engineering Offices in Principal Cities

## PRODUCTS AND SERVICE

Centrifugal and Steam Pumping Equipment to meet practically every capacity, pressure and service requirement: Bilge Pumps, Boiler Feed Pumps, Condensation Pumps and Receivers, Fuel Oil Pumping Sets, Hydraulic Pressure Pumps, Jet Condensers, Oil Pumps, Refinery Pumps, Self-priming Centrifugal Pumps, Sewage Ejectors, Sump Pumps, Water Works Pumps, and Vacuum Pumps.

This Company is one of the largest exclusive pump builders. Our position in the field is the result of sound engineering and strict adherence to quality standards. Your inquiry for descriptive bulletins or specific recommendation and quotation is invited.



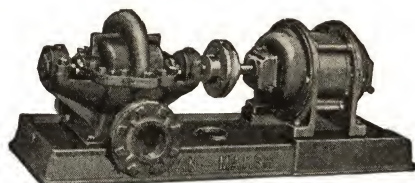
## REDI-OILED DUPLEX POWER PUMPS

Can be furnished in valve plate, side pot piston packed or outside packed plunger type. Design offers mechanical simplicity and full accessibility to all parts. Smooth, quiet operation at low cost insured by use of herringbone gear and pinion, double row ball bearings on pinion shaft and roller bearings on crankshaft. Every moving part thoroughly lubricated from large crank case oil reservoir which requires refilling only at long intervals. Suitable for almost any type and arrangement of drive.



## MOTOR-UNIT CENTRIFUGAL PUMPS

Simple and inexpensive. Pump is attached directly to standard motor with specially machined end bell. Pump bearings, base and coupling are eliminated. Only one stuffing box; no pump lubrication required; easily installed in any position; very compact to save space. Offered in fifteen sizes with capacities 5 to over 500 g.p.m. at heads up to 100 pounds. Suitable for all general service requirements.

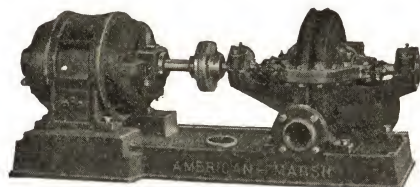


## BALL BEARING CENTRIFUGAL PUMPS

As shown above are single-stage, double suction, split-case type. Standard equipment includes deep-groove precision grade ball bearings, stainless steel shafts and bronze seal rings.

Non-overloading impeller is completely machined and polished, and carefully balanced both dynamically and hydraulically. Low cost operation assured by high mechanical efficiencies. Offered in a wide range of sizes. Suitable for all general service requirements—electric motor, steam turbine, gas engine or belt driven.

We also build a complete line of single-stage, end suction centrifugal pumps.



## MULTI-STAGE CENTRIFUGAL PUMPS

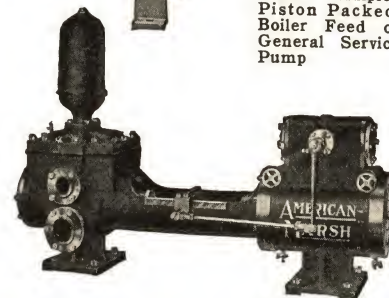
Furnished with ball bearings, stainless steel shafts and bronze seal rings standard equipment. Non-overloading impeller is completely machined and polished, and dynamically and hydraulically balanced. These pumps are recommended for operation against higher heads than the single-stage pumps described above.



At Left: Duplex Piston Packed, Boiler Feed or General Service Pump

## GENERAL SERVICE STEAM PUMPS

Built in a wide range of types and sizes. Suitable for handling other liquids as well as water. Duplex pumps have steam ends that save steam and make for quiet operation at high speeds. Simplex pumps are bronze fitted as standard equipment, and are even more economical in steam consumption.



Below: Simplex Piston Packed, Boiler Feed or General Service Pump



## REDI-RETURN CONDENSATION UNITS

These automatic centrifugal pumps and receivers are compact, dependable and exceptionally low priced. Designed for collecting and pumping back to boiler returns from low or high pressure heating systems. Unit consists of Motor-Unit centrifugal pump described above, welded steel tank and automatic control equipment. Offered in sizes to meet large or small heating requirements.



# ANDALE COMPANY

1600 ARCH STREET, PHILADELPHIA, PA.

*Rotary Screen Water Strainers with Automatic Hydraulic Screen Cleaning*

## A COMPLETELY AUTOMATIC STRAINER

**Continuous Both in Straining and Screen Cleaning Operation.**—Fineness of "mat" straining can be increased or reduced without stopping strainer. Suitable for water, oil, process liquids, etc.

**Application:** No definite line separates the application of the basket type strainer (which must be cleaned by hand) and this completely automatic strainer in which there is no attention required beyond that given a centrifugal pump.

TWO CONDITIONS, however, dictate the use of this automatic strainer: **FIRST**—where the quantity of fluid handled is so great as to require a strainer with baskets of a size that would be unwieldy to handle: **SECOND**—where, regardless of fluid quantity, material would accumulate so fast on the basket as to make cleaning periods so frequent as to require practically constant attention.

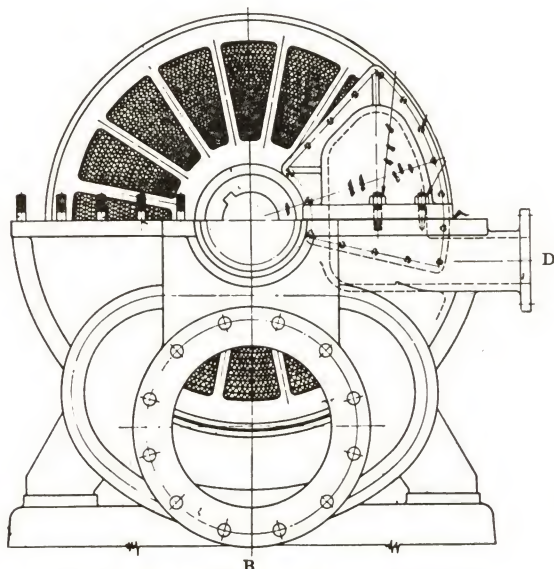
**PARTICULARLY APPLICABLE** to removing automatically from service water—leaves, sea weed, grass and materials of that character which are carried in the water in considerable quantity during the flood periods of spring and fall.

**Construction:** It consists fundamentally of a horizontally split casing and wash boxes, all stationary, and a rotating straining wheel.

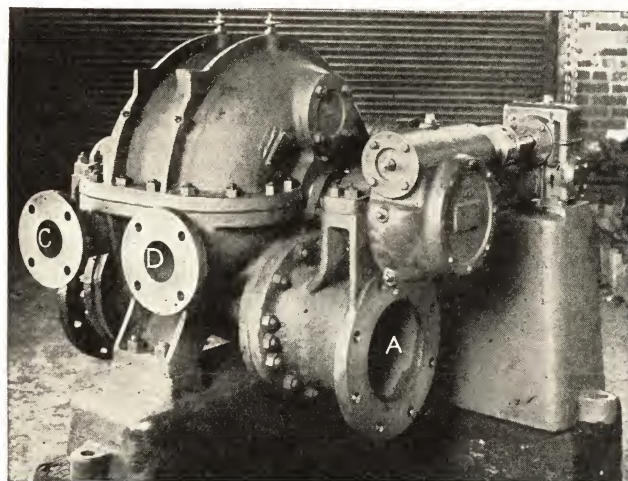
The **CASING** bottom half carries the main stream connections, the bearings for the wheel shaft and the wash boxes and their connections. The top half casing is a cover only.

The **STRAINER WHEEL** is rotated continuously by means of the motor and its gear reduction. Spokes in the wheel divide it into sections.

**OPERATION:** As each section passes between the inlet and outlet wash boxes, solid matter collected in that section is backwashed out under a pressure stream to the refuse pipe leading away from the outlet wash box.



View with Top Cover Removed.  
B, Main Stream Outlet. D, Wash Stream Inlet



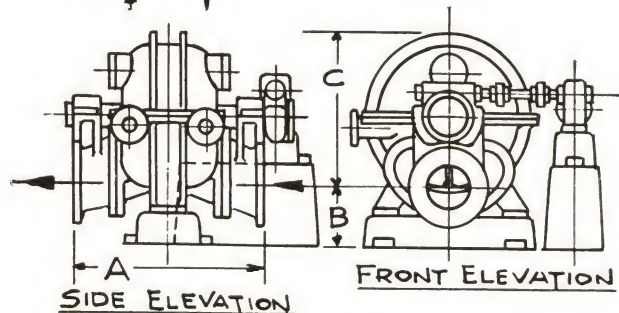
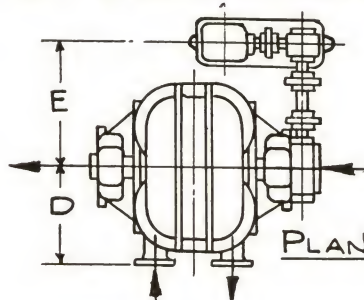
A, Main Stream Inlet. C, Wash Stream Inlet. D, Wash Stream Outlet

The wash stream is entirely separate from the main stream. In operation no valving is necessary on the dirty side of the wash stream, or on the unstrained main stream.

The course of the clean side of the wash stream, outside of the strainer and separated from strained stream, makes it possible to put the control valve on the *clean* side; and, where desirable, a pump, to increase wash pressure and further economize wash volume.

The amount and uniformity of pressure-difference can be maintained by automatic devices. Grid gauge can be as fine as 0.02", and straining through "mat" can be much finer.

This strainer is recommended for conditions beyond the range of our duplex strainers, and where requirements do not call for a sand-filtering water cleanliness.



CAPACITIES 750 TO 20,600 G. P. M.

Frame	Max. Size Conn.	Dimensions					Max. Capacity G.P.M.
		A	B	C	D	E	
A	6	27	8	21	13	18	750
B	10	33	10½	25¼	16	21½	1300
F	12	43	12½	32½	21	27	2650
H	16	48	13¾	40¼	25	32½	5600
K	20	56	17	45½	27	38	9400
M	24	60	20	53	33	43	14000
R	30	67	23	63½	38	49	20600

Dimensions in inches.



# ANDALE COMPANY

1600 ARCH STREET, PHILADELPHIA, PA.

Cables: "ANDALE PHILADELPHIA"

## AFTERCOOLERS FOR COMPRESSED AIR

The reasons why an aftercooler should be installed wherever compressed air is being used are now generally recognized.

The money savings they afford, and the dangers and continuing losses that occur where compressed air is not at least partially cooled and dried before entering the pipes, are summarized in bulletins which we will supply on request.

When once the need is recognized in any plant it becomes a question, first, of the actual amount of cooling and drying that is required, in the situation and in its operating conditions; and second, of the most economical way of attaining them—without over-expense in operation, equipment or maintenance.

We invite correspondence on such questions and offer our experience in dealing with situations and economy problems of many different kinds.

Andale aftercoolers are designed with a view to maximum economy in heat transference, with maximum durability and dependability in service. They are suitable for:

1. Partial cooling. Using only the cooling water that is available, at seasonal surface temperatures, and with no added refrigeration whatever. Completely meeting the operating requirements in most situations. Not cooling to the temperature of the atmosphere, but giving the compressed air the coolness and dryness that the operating requirements, and accurate economy, require.

2. Complete cooling. Using the cooling water that is available, with added refrigeration when the temperature of the water makes it necessary. Making the compressed air, before it enters the pipes, as cool as the atmosphere that surrounds the "coolest spot on the line." So that any cooling in the pipes, and any precipitation of moisture in the pipes, are impossible.

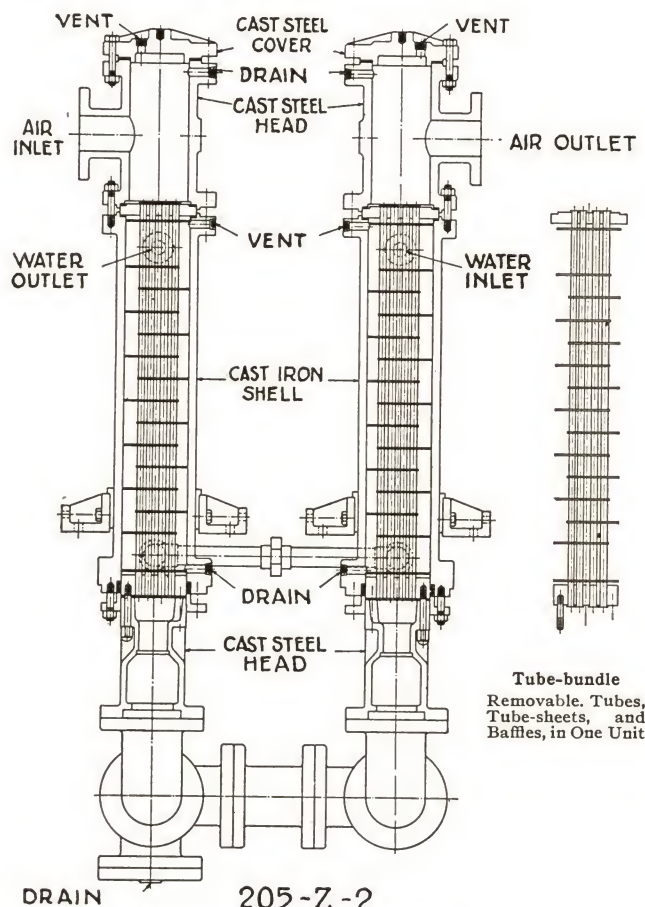
Andale designs and specifications are now well known in the market. However there are a number of reasons why a copy of an Andale design and materials cannot be expected to equal the dependability and long time economy of an aftercooler made in the Andale way.

In the design illustrated—and in all Andale aftercoolers, small or large—the flow of air is counter to the flow of water. The air is inside the tubes. Water is around the tubes. Number of tubes is determined by the velocity desired; length is determined by extent of cooling desired.

Baffles are arranged to give to the water the velocity that results in the most economical use of the cooling surface. Baffles fit closely. The inside of the shell is bored. The entire tube bundle (tube sheets, tubes and baffles), is removable as a unit. The tubes can be cleaned of any oil or carbon accumulated from the air, without removal.

Tube sheets are forged bronze of high tensile strength to ensure tight expansions. Tubes are seamless admiralty metal, tested individually to 1000 pounds per square inch before being expanded. They are expanded into the tube sheets to avoid tube seams and tested again at high pressure. No leak between sheet and tube expanded and tested in the Andale way has ever been reported.

Baffles are manganese bronze, to avoid rusting to the shell. Shell is cast iron, bored, and is under water pressure only. Heads are steel. The floating head is bolted direct to the floating tube sheet.



One of the Andale Aftercoolers

The stuffing box at the floating end allows for expansion and contraction of the tube element. It is under water pressure only. No stuffing box is under air pressure. No stuffing box is needed on the air, so no buried gasket construction is needed at the floating end.

There are no buried gaskets in any Andale designs. If any gasketed joint leaks it leaks to atmosphere.

Metals used for each part are those proved best for strength, long duty, and economy in heat transference.

**Duty Performance.**—Design Z-2: Cooling compressed air to within 2° of the cooling water temperature; cooling per minute 100 cubic feet of free air compressed, with one gallon of clean water; extracting 20,000 BTU's per hour. In cooling the air and condensing the vapor, the water temperature rises 40°.

Cooling can be correspondingly less with a larger volume of air per minute, or with smaller volume of water.

Special coolers can be designed to use half the amount of water to do the same amount of cooling; the water temperature rising 80°.

Design Z-15 (one half of Z-2), cools air to within 15° of the cooling water temperature, on the basis of one gallon per minute and 100 cubic feet of air per minute. It can be converted to Z-2 at any time by adding the other unit.

Andale aftercoolers are made in sizes for any volume and for all pressures, up to 5000 pounds. Smaller sizes, with copper shell, are available for small installations.

Any aftercooler recommended by Andale for any installation will perform exactly to specifications for the life of the compressor it serves.



# THE ANTHONY COMPANY

47-33 FIFTH ST., LONG ISLAND CITY, N. Y.

*Liquid Fuel Engineers*

## PRODUCTS

ANTHONY NEBULYTE SYSTEM for boilers and for furnaces; ANTHONY NEBULYTE OIL BURNERS, GAS BURNERS, TAR BURNERS, COMBINATION OIL, TAR and GAS BURNERS, TORCHES.

ANTHONY NEBULYTE OIL, TAR and GAS BURNING EQUIPMENT for all industrial heating processes.

ANTHONY NEBULYTE OIL and TAR SPRAYS for gas plants and SPRAYS for all liquids.

ANTHONY OIL, TAR and GAS FORGES, CRUCIBLE FURNACES and HEAT TREATING FURNACES.

ANTHONY SINGLE and DUPLEX STRAINERS; STEAM and ELECTRIC FUEL OIL HEATERS; TANK SUCTION UNITS; HAND and AUTOMATIC CONTROLS.

## ENGINEERING SERVICE

Anthony engineers are prepared to discuss all heating problems and design special oil, tar or gas fired apparatus for specific needs. Having designed a great variety of successful industrial heat treating systems, they have wide experience in this field to place at a client's disposal. THE ANTHONY COMPANY since its organization has dealt with every application as an individual combustion problem, appreciating as no others have its many sensitive and variable conditions, and accurately meeting these by correctly utilizing essential principles.

They are pioneers in the development of mechanical nebulization as applied to the combustion of liquid fuel, as well as in the application of those combustion principles which effect the accurate control of heat quality. Employment of their services leads to conservation of fuel, speeding up of production, and better quality of output as 5000 clients will testify.

More than 28 years of record-smashing success.

## ANTHONY NEBULYTE SYSTEMS

**For Boilers:** A mechanical nebulizing system which actually attains the perfection of radiant gas firing and normally produces 80% to 86% evaporating efficiency.

**For Furnaces:** A mechanical nebulizing system of gas firing with oil fuel, effecting an instantaneous conversion of liquid to gas by correct combination of essential elements.

## ANTHONY NEBULYTE BURNERS AND TORCHES

The first free-acting nebulizers applied to industrial furnaces.

Applicable whether forges, furnaces, stills, dryers, boilers, kilns or other apparatus require heat. Low and high pressure designs to suit every requirement.

70,000 installations of proven superiority.

## ANTHONY FUEL EQUIPMENT

The continuous and successful operation of any fuel system depends upon the use of correct equipment, installed and adjusted in accordance with established facts. Special equipment for every part of liquid and gas fuel systems supplied, based upon the experience of many years. Tanks, pumps, blowers, valves, gauges, meters and all necessary appurtenances.

## ANTHONY FUEL OIL HEATERS

Fuel oil heaters are essential in every oil burning system using oils of relatively heavy gravity. Anthony heaters are supplied to give the required temperature to the particular grade of oil specified. Furnished complete with safety relief valve, thermometer, and, where desired, automatic temperature control.

## ANTHONY STRAINERS

Both single and duplex types. In the duplex strainers, either side can be cut out by a single lever movement. They need not be taken apart for cleaning. They are easily applied to any pipe line. The cleaning operation is made so simple that there is no excuse for strainers ever becoming foul.

## ANTHONY FORGES AND FURNACES

These include rivet forges, crucible furnaces and a general line of heat treating furnaces built to take advantage of the superior operating characteristics of Nebulyte Burners.

Simple, compact, sturdy, non-oxidizing. Low operating cost. Portable and stationary.

## ANTHONY NEBULYTE SPRAYS FOR GAS PLANTS

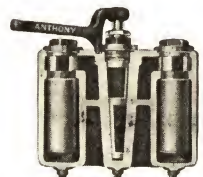
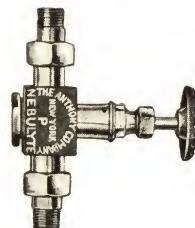
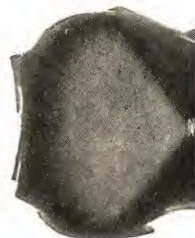
These are mechanical nebulizers of oil or tar—scientific distributors of spray. They are the means of distributing oil or tar in correct quantity over selected parts of a gas machine or generator as the operator may require.

Anthony Nebulyte Sprays are milestones in the progress of gas manufacture. All sprays are built to meet the scientific requirements of each installation. Adapted to suit any prevailing conditions.

These sprays are of simple design and sturdy construction. They give perfect nebulization, positive control and correct distribution.

## ANTHONY NEBULYTE SPRAYS FOR ALL LIQUIDS

Sprays supplied of definite capacity and throw which can be utilized for many purposes, such as cooling, aerating, atomizing, gasifying, mixing, absorbing gases and vapors, and for all purposes where it is desired to distribute a liquid in finely divided form over a large area, or through a large volume. Scientific distributors. Free acting. Conical and flat types.





# E. B. BADGER & SONS CO.

Engineers and Manufacturers

75 PITTS STREET, BOSTON, MASS.

*Manufacturers of Corrugated Copper Expansion Joints, Pipe Bends, Chemical Apparatus,  
Copper and Sheet Metal Work, Copper Boilers, Hot Water Tanks.  
Engineers on Process Work*

## BRANCH OFFICES

ATLANTA, GA. . . . . 140 Edgewood Ave.  
CHARLOTTE, N. C. . . . 1408 Independence Bldg.  
CHICAGO, ILL. . . . . 2831 South Parkway  
CINCINNATI, OHIO . . . . 514 Main St.  
CLEVELAND, OHIO . . . . Guardian Bldg.  
DETROIT, MICH. . . . . 702 Cadillac Sq. Bldg.  
HOUSTON, TEX. . . . . 1308 Second National Bank Bldg.

INDIANAPOLIS, IND. . . . 823 Occidental Bldg.  
KANSAS CITY, MO. . . . . 1336 Oak St.  
LOS ANGELES, CAL. . . . 812 Quimby Bldg.  
MINNEAPOLIS, MINN. . . . 732 Builders Exchange  
MONTREAL, QUE. . . . . Canada Cement Bldg.  
NEW ORLEANS, LA. . . . . 1666 Abundance St.  
NEW YORK, N. Y. . . . . 271 Madison Ave.

PHILADELPHIA, PA. . . . . 1500 Walnut St.  
PITTSBURGH, PA. . . . . Union Trust Bldg.  
ST. LOUIS, MO. . . . . 3605 Laclede Ave.  
SALT LAKE CITY, UTAH . . . . Kearns Bldg.  
SAN FRANCISCO, CAL. . . . . Sharon Bldg.  
SEATTLE, WASH. . . . . Smith Tower  
TULSA, OKLA. . . . . 409 E. Archer St.

## BADGER SELF-EQUALIZING EXPANSION JOINTS:

A series of important developments has marked the progress of the Badger Corrugated Type Expansion Joint since it was first placed on the market more than forty years ago. In order, these developments are: perfection of practical method for forming corrugations with uniform thickness; elimination of manufacturing stresses; adoption of seamless copper tubes; adoption of equalizing rings; use of Monel metal sleeves for protection against superheated steam; design of welding end joints; special de-oxidized copper; Directed Flexing Feature.

Important developments such as these indicate two things: that E. B. Badger & Sons Co. is responsible for the design of the modern corrugated joint as used today and that Badger engineers understand thoroughly the problems involved in pipe line movements and how to properly use expansion joints.

The corrugated type of expansion joint does not make use of packing, hence this problem of maintenance does not exist.

**Directed Flexing Feature:** This, the latest of E. B.

Badger & Sons Co. developments and exclusive with these joints, has brought about a marked increase in the life of the corrugated type of joint. In the earlier designs, flexing stresses could be limited but there was no assurance they would distribute themselves throughout the corrugation. The Directed Flexing feature does this. The corrugation, being *all-curved* in shape, follows an undulating



movement in flexing. It wraps and unwraps itself using the equalizing ring as a guide. Having all-curved surfaces, there are no points where stresses can localize. Accelerated tests show a life several times greater than the joints with the customary corrugation.



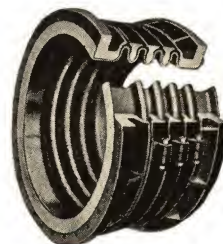
**Different Types Available:** Both flanged end and welding end joints are available from 3 in. (welding) and 4 in. (flanged) up. Single or double joints with or without service outlets. All joints can be equipped with telescoping monel metal sleeves to protect against superheated steam.

We can furnish flanged joints less than 4 in. in size by fitting the 4 in. units with companion flanges, bolts and gaskets tapped to the desired size.

**FLANGED TYPES:** Fitted with alignment bars on the 4 and 5 in. sizes. Choice of standard or extra heavy flanges. From 1 in. to 3 in. expansion, inclusive.

On 6 in. pipe and larger, no alignment bar is used. Standard 125 lb. or extra heavy 250 lb. flanges as required. From 1 in. to 4 in. expansion, inclusive.

**WELDING TYPES:** For use with both saturated and superheated steam. Single type from 3 in. up, to take care of 1 in. expansion or more. Pipe nipples welded directly into pipe line.



Double units for 2 in. expansion or more. Equipped with service outlets if desired. Complete units furnished, mounted on base plate, with anchor and guides.



## SINGLE AND MULTIPLE CORRUGATED EXPANSION JOINTS FOR LOW PRESSURE:

For use between turbine or engine exhausts and condenser or on low pressure lines. Excellent for absorbing shock and vibration. Flanges in round, oval or rectangular shapes. Guaranteed up to 30 lb. pressure.



# THE BABCOCK & WILCOX COMPANY

GENERAL OFFICE  
85 LIBERTY STREET, NEW YORK, N. Y.

## BRANCH OFFICES

ATLANTA, GA. . . . Candler Building  
BOSTON, MASS. . . . 49 Federal Street  
CHICAGO, ILL. . . . 20 North Wacker Drive  
CINCINNATI, OHIO . . . . Carew Tower  
CLEVELAND, OHIO . . . Guardian Building  
DALLAS, TEX. . . . Magnolia Building  
DENVER, COLO. . . . 444 Seventeenth Street  
DETROIT, MICH. . . . Ford Building

GALVESTON, TEX. . . Security Building  
HOUSTON, TEX. . . . Electric Building  
LOS ANGELES, CAL. . . Edison Building  
NEW ORLEANS, LA. . . 344 Camp Street  
NEW YORK, N. Y. . . . 85 Liberty Street  
PHILADELPHIA, PA. . . Packard Building  
PHOENIX, ARIZ. . . . Luhr's Tower  
PITTSBURGH, PA. . . . Koppers Building

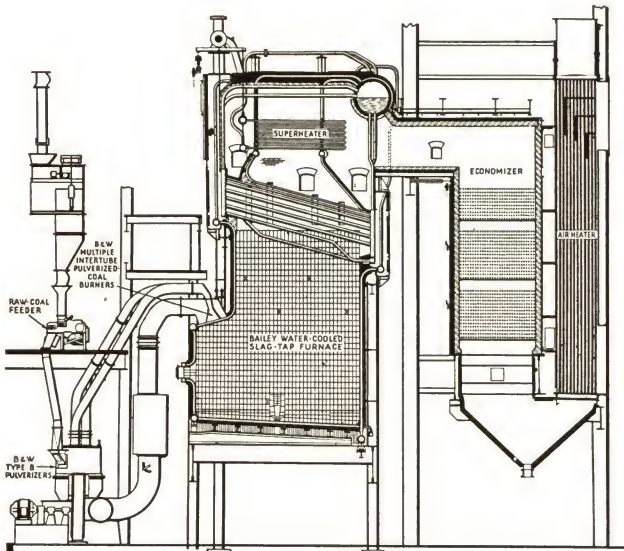
PORTLAND, ORE. . . . Failing Building  
SALT LAKE CITY, UTAH, Kearns Building  
SAN FRANCISCO, CAL., 450 Mission Street  
SEATTLE, WASH. . . . . Smith Tower  
TULSA, OKLA. . . . Thompson Building  
HAVANA, CUBA . . . Calle de Aguiar 104  
HONOLULU, T. H., Castle & Cook Building  
SAN JUAN, P. R. . . . . Recinto Sur 54

An important consideration in the selection of Babcock & Wilcox equipment for the generation of steam is the ability of this company to furnish complete units, from the raw-coal feeders or fuel-oil tanks to the stacks—units that are designed as such, and that are backed by the responsibility of a single manufacturer and covered by a single guarantee.

## B & W BOILER:

The B & W Boiler is noted for its ability to produce dry steam, even when operated at high ratings, due to positive and rapid circulation throughout the headers and tubes, together with effective separation of steam and water in the drum. Its inherently compact design and its ability to operate satisfactorily at high ratings combine to make possible an unusually large steam output for the space occupied.

The design provides great latitude in the width, height, and length of boiler for various conditions of plant space, combustion method, fuel, and operating requirements. Similarly, where a superheater is required it may be located in the over-deck position or placed between decks of generating tubes, according to the amount of superheat required, without altering the path of the gases as they flow through the boiler or changing the fundamental design of the boiler.



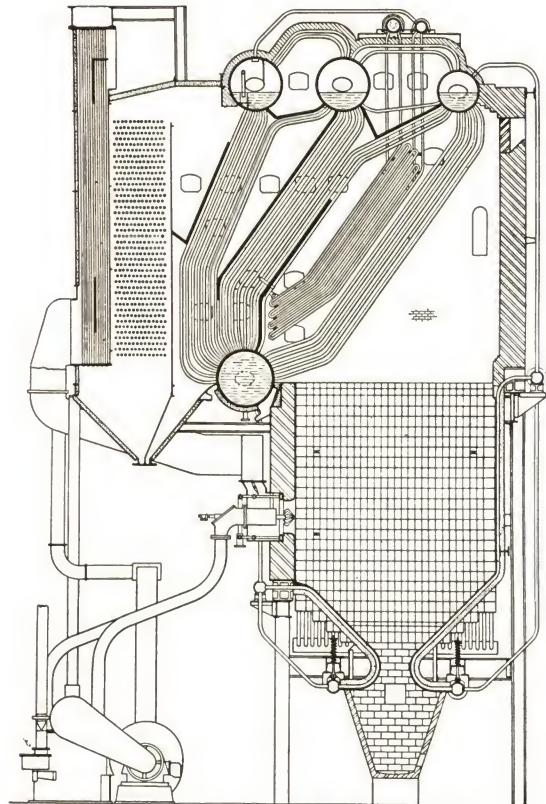
Complete B & W Boiler Unit Including Superheater, Economizer, Air Heater, and Bailey Water-Cooled Slag-Tap Furnace. The Unit is Pulverized-Coal Fired by the Direct-Fired System Using B & W Pulverizers and Burners

Boilers of this type have been built for power service in sizes ranging from a steam output of 1500 pounds per hour up to twin units having a capacity of over 1,000,000 pounds per hour, and for pressures up to 2500 pounds per square inch.

## THE STIRLING BOILER:

Outstanding characteristics of this boiler are its responsiveness to heavy and sudden demands for steam and its ability to deliver dry steam, even with water having a high concentration of solids.

It has ample space for a large superheater, and can utilize any kind of fuel. The number of gas passes can be varied to suit the needs of any particular installation by employing the well-known three-pass arrangement, a four-pass arrangement, or an exclusive low draft-loss single-pass design, which is a patented feature of the present day Stirling Boiler.



Stirling Boiler with B & W Superheater, Return-Bend Economizer, Air Heater, Bailey Water-Cooled Hopper-Bottom Furnace, and B & W Coal Pulverizing and Burning Equipment

The efficiency may be improved by the addition of an air heater, or economizer, or both. Economizers are available in three types—integral, two-drum, and the horizontal straight-tube type with return bends.

Stirling Boilers can be built in sizes ranging in steam output from 1500 pounds per hour to over 1,000,000 pounds per hour in twin units.

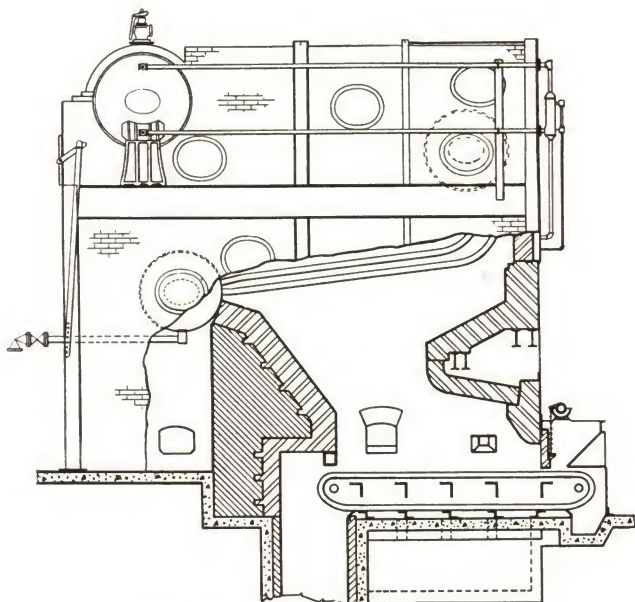


## THE BABCOCK & WILCOX COMPANY

### TYPE H STIRLING BOILER:

The Type H Stirling Boiler is a low-head, moderate-pressure unit of simple design, built to the standards that have so long been associated with the Babcock & Wilcox name.

This boiler is used in small electric generating plants, in industrial power plants for a wide range of process operations, and for heating buildings of many classes. It is readily adapted to any kind of fuel and any method of firing. Superheaters can be installed in the larger sizes.



Type H Stirling Boiler with Chain-Grate Stoker

Distribution baffles in the form of T-tile maintain uniform distribution of the gases over the tube bank in the first pass. This important feature, together with the arrangement of additional gas-pass baffles, insures maximum capacity and efficiency of the boiler.

The Type H Stirling Boiler is built in 36 sizes, with capacities ranging from 1500 to 30,000 pounds of steam per hour.

### WASTE-HEAT BOILERS:

Babcock & Wilcox Waste-Heat Boilers are used extensively in steel mills, cement plants, and for a wide range of heat-recovery services. They are available in gas-tube or water-tube types, and, according to the type, are well suited to the utilization of heat in gases which, for any reason, should not be allowed to escape from the system except through the stack, and also to the utilization of gases having a high dust content.

### SPECIAL BOILERS AND HEAT-TRANSFER SYSTEMS:

Babcock & Wilcox boilers and heat-transfer systems using such high-boiling-point liquids as mercury, diphenyl, diphenyl oxide, or Dowtherm are available for

operation over a wide range of temperatures. These systems reflect the Company's extensive research with these fluids and its skill and experience gained in the construction of steam boilers and allied equipment. As a result of this experience, the Company is in a favorable position to make unbiased applications of these fluids to specific operating conditions.

### STEAM SUPERHEATERS:

The design of a superheater to meet modern requirements of pressure, temperature, and capacity is an engineering problem which, because of its complexity and close association with that of the boiler itself, lends great importance to the experience of The Babcock & Wilcox Company in their installation. This experience covers a period of more than thirty years in designing superheaters for a range of conditions as varied as those under which the Company's boilers operate.

Important characteristics common to all B & W Superheaters are: uniform distribution of steam through the tubes, provision for effective cleaning during operation, and accessibility for inspection and repair. Specially designed supports hold the superheater securely in place yet permit expansion of the tube rows.

In addition to superheaters of the convection and radiant types, the Company also builds separately-fired and steam-heated reheat superheaters.

### B & W RETURN-BEND ECONOMIZER:

The Babcock & Wilcox Wrought-Steel Return-Bend Economizer efficiently utilizes the heat of flue gases in heating boiler feedwater, thus effecting appreciable savings in fuel.

The B & W Economizer consists of interconnected sections of horizontal seamless steel tubes so disposed across the path of the hot gas as to ensure a high rate of heat transfer with minimum resistance to the flow of gas and water. The unit is gas tight under all conditions of operation. All parts are readily accessible for inspection, cleaning, and repair.

This economizer has been built in sizes ranging from 357 to 31,200 sq. ft. of heating surface, and for working pressures up to 1450 lb. per sq. in. B & W Economizers of special design, to meet unusual conditions of operation, are also available.

### B & W AIR HEATER:

The B & W Air Heater is used primarily for preheating air for combustion and is adaptable to boilers fired with any fuel.

The heater consists of a nest of seamless steel tubes expanded into upper and lower tube plates and enclosed by a steel casing. Baffles are so arranged in the casing as to ensure even flow of air over the outer surface of the tubes with minimum draft loss. The hot gases flow through all tubes at uniform velocity; thus preventing the formation of gas pockets, which are

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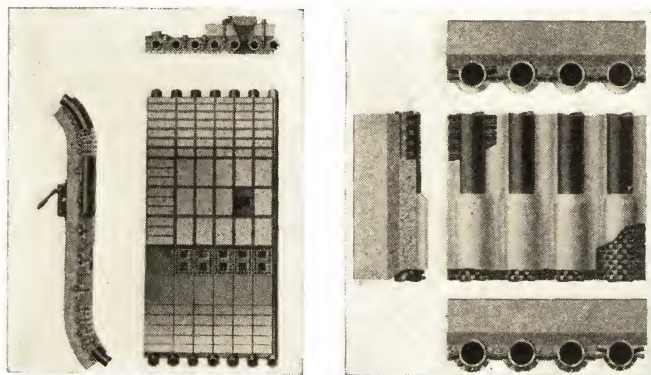
common sources of tube corrosion. The heater is inherently tight, permanently separating the streams of gas and air. The heating surface may be readily cleaned, to continuously obtain efficient transfer of heat.

The heater is available in sizes ranging from 218 to 80,200 sq. ft. of heating surface.

Direct-fired B & W Air Heaters are also available. In addition, the Company can supply air heaters of the plate type.

## BAILEY WATER-COOLED FURNACE CONSTRUCTION:

B & W Bailey Water-Cooled Furnace Construction permits efficient operation of boiler furnaces at high rates of heat liberation with a factor of availability and freedom from maintenance unsurpassed by other furnace constructions. Bailey Furnace Construction decreases the limitations on excess air, furnace temperatures, and heat liberation to such an extent that combustion chambers may be small in volume, and greater fuel-burning capacity may be provided in a given space.



Sections of Block-Covered and Stud-Tube Constructions Providing Flexibility of Surfaces with Bailey Water-Cooled Furnace Walls

Furnaces of this construction are in use in central stations and industrial plants in almost every country. They are fired in every commercial manner and with practically every kind of fuel. The Bailey Furnace Wall alone can meet this entire range of conditions.

This water-cooled wall is designed to present hot surfaces in the zones that must be hot to promote ignition and assure efficient combustion of the fuel. Cold surfaces in the same furnace may be provided where chilling of gas and ash is required or where clinker adhesion is undesirable. The flexibility of construction permits furnace shapes best suited to the space and combustion conditions encountered, with an air-tight and structurally strong wall.

The block type of Bailey Wall Construction provides a variety of surfaces for meeting the combustion requirements in different furnace zones by means of blocks mounted separately on, and bonded in close thermal contact with, the water-cooled tubes.

A second type of Bailey Wall Construction is provided by the Stud-Tube Construction, which consists of water-cooled tubes covered with refractory material held in place by studs welded to the tubes. This con-

struction may be used in conjunction with the block construction or to form entire walls.

## B & W PULVERIZED-COAL BURNERS:

B & W Burners for pulverized coal are of the turbulent type by means of which the coal and air are intimately mixed immediately on entering the furnace. Quick ignition and rapid combustion with short flame travel are thereby obtained.

The use of these burners results in the simplification of furnace and fuel-burning equipment, definite control over the distribution of heat within the furnace, and considerable reduction of furnace volume.

These burners are available for different types of furnace construction and in heat liberating capacities up to 144,000,000 B.t.u. per burner per hour.

## B & W MECHANICAL-ATOMIZING OIL BURNERS:

B & W Mechanical-Atomizing Oil Burners are highly efficient at all rates of fuel feed because of the turbulent mixing of the fuel and air effected by scientific atomization of the fuel and positive control of the air flow. They will properly atomize all commercial grades of fuel oil and are adaptable for operation with natural or forced draft.

These burners are available in a range of heat-liberating capacities that meet every commercial requirement.

## COMBINATION BURNERS:

B & W Combination Burners permit the use of liquid, gaseous, or pulverized solid fuels, alone or simultaneously. Efficient combustion is obtained with these fuels since they are thoroughly mixed with the necessary air by the burners.

## CHAIN-GRATE STOKER:

Babcock & Wilcox Chain-Grate Stokers are suitable for use with any free-burning bituminous coal, anthracite, lignite, or coke breeze. They are adaptable to natural, induced, or forced draft, depending upon the type of stoker and the conditions under which it is designed to operate. Each stoker, including the smallest size operated with natural draft, has separate air compartments under the grate and correctly proportioned dampers for the regulation of the amount of air admitted to the grate in meeting the requirements of the fuel bed.

Double-reduction worm-gear drive, bearings of ample proportions, links ground to size and drilled with jigs, and many other important details of design and construction mark these stokers as typical B & W products.

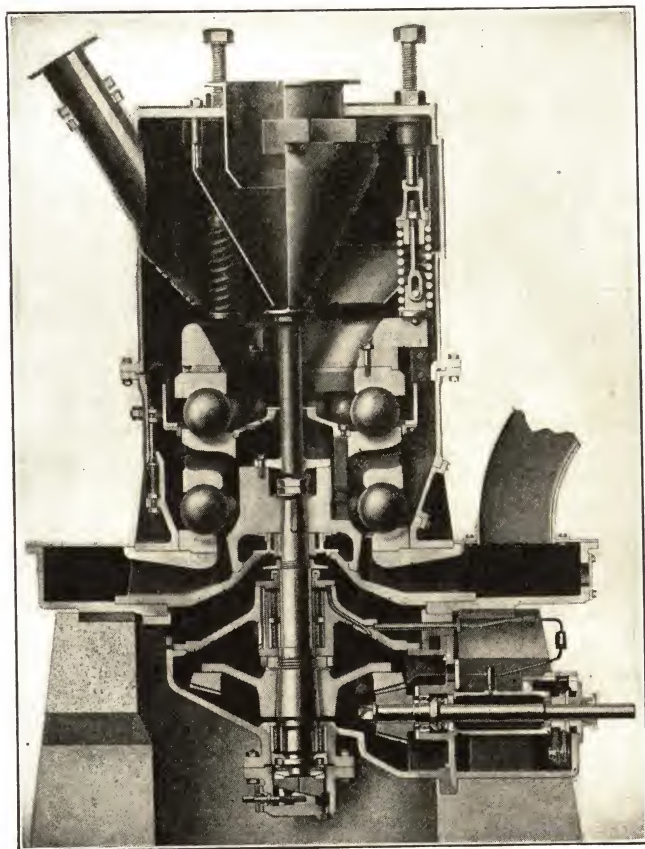
They are made in three types: the Standard Type, in sizes up to 138 sq. ft. of grate area; the Intermediate Type, in sizes ranging from 90 to 235 sq. ft. of grate area; and the Heavy-Duty Type, in sizes from 270 to 615 sq. ft. of grate area.



## THE BABCOCK & WILCOX COMPANY

### B & W TYPE B PULVERIZER FOR COAL:

The B & W Type B Pulverizer employs a grinding principle that has been successfully and economically used over the range of capacities required by present



Sectional View of B & W Type B Pulverizer

practice, and for all available solid fuels. Noteworthy features of the Type B Pulverizer include: the small space required for installation, consistent performance in fineness and capacity, low power consumption, low cost of maintenance, and low cost of lubrication.

In the Type B Pulverizer the ball-bearing principle has been adapted to the grinding operation. The grinding element consists of one or more rows of balls interposed between stationary and rotating grinding rings. The balls are propelled by a rotating ring that floats on, and is driven by, the main shaft. The construction is such that the pressure on, and the rate at which material flows through, the grinding elements can be regulated to suit the character of the material being pulverized. This type of grinding element is economical in operation and has been applied to mills having capacities ranging from a few pounds up to 50 tons or more per hour each.

### BAILEY PULVERIZED-MATERIAL FEEDER:

The Bailey Feeder is widely used in central stations and industrial power plants to deliver pulverized coal uniformly from storage bins to boiler furnaces, and in cement plants to feed rotary kilns. The operation of the feeder is such that it discharges a measured stream of uniformly aerated coal. The rate of feed is adjustable over a wide range. The feeder is available for capacities up to 12,000 pounds of pulverized coal per

hour. This feeder is also adapted to the feeding of other pulverulent materials.

### FULLER-KINYON TRANSPORT SYSTEM FOR PULVERIZED COAL:

The Fuller-Kinyon Transport System is a clean and economical method of transporting and distributing pulverized coal. Because of its great flexibility, this system is especially advantageous in those plants in which the coal pulverizers are far removed from the bins, kilns or furnaces. They are available in single line capacities ranging from 1 to 100 tons of pulverized coal per hour.

### DRIERS:

The Fuller Lehigh Rotary Drier and the Randolph Vertical Drier are suitable for drying large quantities of materials that cannot be injured by direct contact with the hot products of combustion. A high rate of moisture removal is obtained with each type of drier. These driers are available for drying up to 30 tons of coal per hour each.

### B & W 80 REFRACTORIES:

B & W 80 Refractories, comprising two grades of firebrick—the B & W 80 and B & W 80 Junior—five mortars and plastics, and B & W Insulating Firebrick are made of specially processed Kaolin. This group is particularly adapted for use where operating conditions are unusually severe, and where fireclay products either are unsuitable or deteriorate rapidly.

### SPECIAL PROCESS EQUIPMENT:

Special process equipment manufactured by The Babcock & Wilcox Company includes pressure vessels, drums, castings, forgings, and tubular products, the application of which is indicated by the following list of typical products:

Gasoline Towers	Vacuum Chambers
Tar Stills	Digesters
Oil Drums	Vulcanizers
Expansion Chambers	Penstock Piping
Accumulator Tanks	Cast-Alloy Pipe Fittings
Reaction Chambers	Forged Return-Bend Fittings
Autoclaves	Evaporators
Mercury-Vapor Heat-Transfer Systems	
Automatic-Control Cooking System for Pulp Mill Digesters	

### SPECIAL CASTINGS AND FORGINGS:

**Elverite:** A chilled cast-iron product is widely used in the reduction and pulverization of rock products, cement clinker, ores and other abrasive materials. It is unexcelled for long life in this service.

**Adamantine:** A superior grade of manganese-chromium steel, available in cast or forged shapes for service where resistance to abrasion, great strength and machinability of wearing surfaces are required. It is produced in electric induction furnaces, whereby the composition and production conditions are accurately controlled.



# BAILEY METER COMPANY

1034 IVANHOE ROAD, CLEVELAND, OHIO

BOSTON  
NEW YORK

PHILADELPHIA  
BUFFALO

PITTSBURGH  
ERIE

CINCINNATI  
ATLANTA

CHICAGO  
MILWAUKEE

ST. LOUIS  
ST. PAUL

KANSAS CITY  
HOUSTON

DENVER  
SAN FRANCISCO

BAILEY METER COMPANY LIMITED, MONTREAL, QUE., CAN.  
WINNIPEG

## PRODUCTS:

Boiler Meters  
Boiler Water Level  
Recorders  
Coal Meters  
Combustion Control  
Compression Fittings  
Desuperheat Controls

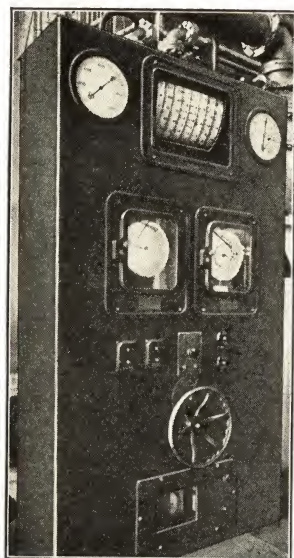
Draft Controllers  
Draft Recorders  
Feed Water Control  
Flow Controllers  
Fluid Meters  
Gravity Recorders  
Liquid Level Controllers



Liquid Level Recorders  
Multi-Pointer Gages  
Potentiometer Pyrometers  
Pressure Controllers  
Pressure Recorders  
Pump Governors  
Resistance Thermometers  
Sewage Meters

Smoke Recorders  
Tachometers  
Telemetering Systems  
Temperature Controllers  
Temperature Recorders  
Test Water Cooling Coils  
V-notch Weir Meters  
Venturi Tubes

All manufactured under the trade-name "Bailey".



Bailey Boiler Panel

## BOILER PANEL:

Designed to give complete information for controlling the operation of any boiler.

The panel contains a Bailey Boiler Meter, a Bailey Fluid Meter with which is combined a Boiler Water Level Recorder, and a Bailey Multi-Pointer Gage. The type of each depends upon the operating conditions in each case.

All factors of primary importance are recorded on 12-in. uniformly graduated meter charts and secondary factors are indicated on illuminated scales immediately above, so that the boiler operator has everything right before him to obtain

desired capacity and best efficiency at all times.

## BOILER METER:

Records and integrates *steam flow* from boiler, records *air flow* supplied for combustion, and records *flue gas temperature*.

Through the *steam flow—air flow* relation, the meter shows preventable losses as soon as they occur and indicates how to eliminate them. The operator secures best efficiency by keeping the *steam flow* and *air flow* pens together. The *flue gas temperature record*, when compared with these records, shows the condition of baffles and tubes.

*Described in Bulletin No. 44.*

## MULTI-POINTER GAGE:

This gage is made with any number of pointers and any scale combinations from one to twelve. The pointers have a 10-in. motion over plainly marked, illuminated scales so that readings can be taken at a distance of 20 ft.

The form is so convenient and easily read that it has been developed to show draft, pressure, temperature, rate of flow, stoker speed, and other factors, thus indicating in one instrument all the secondary operating conditions.

*Fully described in Bulletin No. 162.*

## BOILER WATER LEVEL RECORDER:

This provides a record of actual water level throughout the full range of the boiler drum to check the operation of feed water regulators, to guide manual control, and to prevent or determine the cause of boiler failures. This recorder may be combined with a feed water meter to record both factors on one chart.

Remote indicators and records, operating from the main recorder, can be placed at other points if desired.

*Full details in Bulletin No. 112.*

## COAL METER:

A sturdy, accurate meter for measurement of coal or other granular material in gravity chutes from overhead bunkers. The total amount is shown on a large illuminated counter which can be read easily at a distance of 50 ft.

*Write for Bulletin No. 221.*



Bailey Coal Meter



Bailey Fluid Meter

## FLUID METER:

Records and integrates flow of steam, gas, water, and other liquids at any pressure. Recorders of pressure and temperature can be incorporated to record on same chart with flow if desired.

*Described in Bulletin No. 300.*

Electrically operated fluid meters can also be supplied when it is desirable to place the instruments at a considerable distance from the pipe line.

## RECORDERS:

Bailey Recorders are available in numerous types containing as many as four pens to record any combination of pressures or temperatures on a 12-in. uniformly graduated chart.

## CONTROLLERS:

Bailey air operated Controllers automatically regulate vital factors such as flow, pressure, temperature, and liquid level in process operation. They are self-contained in sturdy pressed steel casings which match other Bailey Recorders and Indicators.

*Complete information in Bulletin No. 100.*



## BAILEY METER COMPANY

### BAILEY METER CONTROL:

Bailey Meter Control automatically regulates the supply of fuel and air to steam boilers to handle the variations in load. It controls the supply of fuel and air simultaneously, in accordance with the demand for steam, and continuously readjusts the air to maintain the proper proportion of air to fuel as well as the desired furnace draft for best efficiency. It operates the boiler so as to automatically maintain test results in every-day operation.

Immediate response in controlling feed water flow to parallel changes in Steam Flow is secured with the Bailey Three-element Feed Water Control. Operating from Steam Flow, Feed Water Flow, and Boiler Water Level, the control maintains the boiler feed always at the rate best suited to existing conditions, thus assuring safe and smooth performance of boilers and turbines.

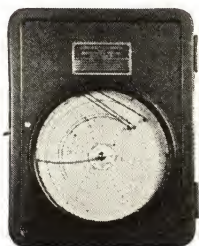
*Described in Bulletins No. 102, 181 and 182.*

### FEED WATER REGULATOR:

The thoroughly reliable Bailey Thermo-Hydraulic Feed Water Regulator delivers effective regulation at all ratings. Because of its fully balanced valve, it quickly and easily meets changes in load.

Low installation cost, removable valve parts, and independence of valve location are other distinctive features.

*Completely described in Bulletin No. 83.*



Galvatron, the  
Bailey Pyrometer

### PYROMETER:

Galvatron, the Bailey Potentiometer Pyrometer continuously records as many as four temperatures on a circular chart.

An electronic relay from which this recorder takes its name insures split-second response to changing conditions as measured by a sensitive galvanometer in the thermo-couple circuit.

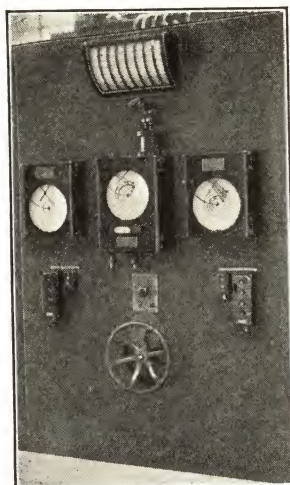
Complete accessibility and protection of the galvanometer and electronic relay units are afforded by mounting them in separate dust tight compartments on a hinged panel within the sturdy pressed steel casing. Automatic standardization of direct current voltage at four hour intervals insures accuracy of the potentiometer.

*Described in Bulletin No. 140.*

### SMOKE DENSITY RECORDER:

Relative smoke density in stacks and breechings is accurately measured by the Galvatron Smoke Recorder which consists of a light-photoelectric cell operated sending device and a recording Galvatron similar to the one described above.

*Ask for Bulletin No. 140.*



Individual Boiler Control Panel  
of Bailey Meter Control System

### TELEMETERING EQUIPMENT:

Bailey Telemetering Systems record and indicate flow, pressure, temperature, level and other factors measured at different points. Telephone lines may be used for transmission.

*Write for Bulletins No. 110 and 140.*

### METER PANEL:

Panel boards are made up of steel plate in proper sizes to give a symmetrical and uniform appearance. They are made of one piece of sheet steel, the sides for supporting the board and the edges being bent back leaving slightly rounded corners.

### WEIR METER:

The V-notch weir offers many advantages for the measurement of water and certain other liquids at or near atmospheric pressure. The flow curve is such that greater accuracy is obtained over a wider range than with any other type of meter.

The meter integrates the total flow in pounds, gallons or cubic feet and records the rate of flow on a 12-in. circular chart, upon which the temperature may be simultaneously recorded.

*Bulletin No. 61 describes this meter in detail.*

### SEWAGE METER:

The Bailey Sewage Meter accurately measures the flow of sewage, sludge, dirty water, or other liquids, using a Venturi Tube, flow nozzle, or orifice as the differential producing device.

This meter is of the open float type with differential gearing and cam designed so that the register operates in direct proportion to the rate of flow. The instruments indicate, integrate and record the flow; charts being 12 in. in diameter and uniformly graduated. Instruments are furnished on a self-supporting panel or unmounted for grouping in a meter gallery.

A complete line of Bailey Meters for sewage treatment and water supply is described in Bulletin No. 39.



### TUBING AND COMPRESSION FITTINGS:

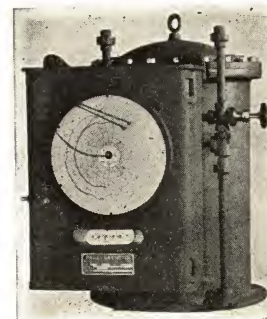
Extra heavy copper tubing, 1/2 in. outside diameter, and compression fittings are ideal as connecting lines to fluid meters, boiler meters, and draft gages. This material is also excellent for small service lines under pressures as high as 800 lbs. per sq. in.

*Details in Bulletin No. 13.*

### GAS METER:

This meter records, and may also totalize the rate of flow of gases under pressures varying from less than atmospheric to 300 lb. per sq. in. The chart is uniformly graduated, 12 in. in diameter with direct reading scales. Pressure compensator, pressure or temperature recorders, may be applied if desired.

*Described in Bulletin No. 35.*



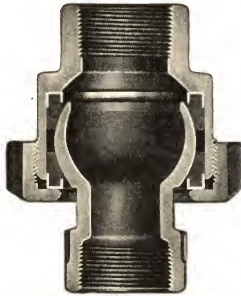
Bailey Gas Meter



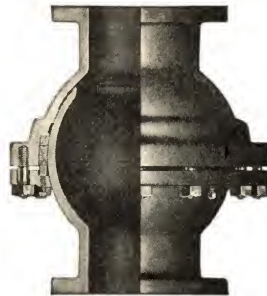
# BARCO MANUFACTURING COMPANY

1801-1815 WINNEMAC AVE., CHICAGO, ILLINOIS

*Manufacturers of Barco Flexible Joints for All Purposes, Barco Low Water Alarm, Barco Power Reverse Gear and Barco Automatic Smoke Box Blower Fittings for Locomotives*



Screw Type Ball Joint



Flange End Ball Joint



Swivel Joint

## BARCO FLEXIBLE JOINTS

Barco Joints have been in successful service during the past ten years in almost all industries where flexible conveyors are required for oil, steam, water, air, gas, etc. These joints are also used to take care of expansion and contraction in pipe lines, and to prevent breaks and leakage from intermittent vibration. Experience has proven that they make the cheapest and most satisfactory flexible fluid conveyors obtainable, taking into consideration the ultimate cost. The first cost is about the same as the cost of other methods and substitutes, and the cost of maintenance is almost negligible unless the service is very severe, in which case the maintenance cost of these joints is almost negligible as compared with other methods of accomplishing the same results.

The gaskets in these joints are suitable for practically all purposes for which metal joints can be used. They are soft enough to provide two perfect seats for the ball at all times, and yet are hard enough to insure long life and freedom from repairs for many years. The design and construction of these joints make them equally serviceable under suction and pressure.

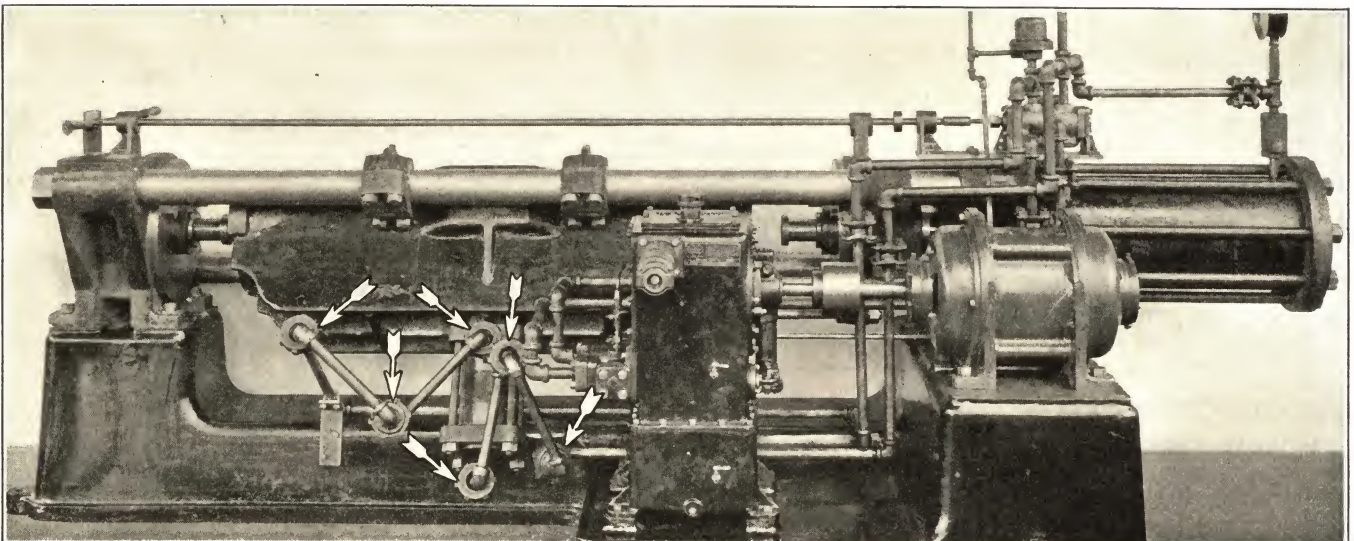
Barco Joints are used on gas holders and many other places in the Gas Industry, being particularly valuable where it is necessary to have flexibility without leakage.

Barco Joints have a wide range of application in the oil-using and oil-consuming industries. They are use-

ful in long pipe lines where expansion and contraction must be allowed for. They are useful in loading and unloading tank cars and tank wagons. They are very tight and the gaskets do not deteriorate when used with oils, gasoline or naphtha.

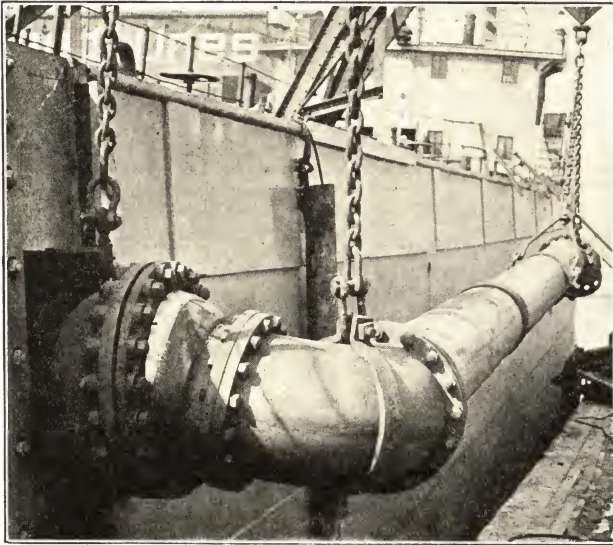
### Used and Recommended for

Ash Handling Equipment	Dredges	Platen Presses
Automobile Washing	Gas Plant Lines	Quarry Pipes
Asphalt Plants	Expansion Lines	Railroad Cars
Baking Ovens	Glass Industry	Railroad Locomotives
Bag Manufacturers	Glue Factories	Railroad Shops
Battery Manufacturers	Hat Industry	Railroad Yards
Bottle Machinery	Hydraulic Lines	Road Machinery
Box Factories	Laundry Machinery	Roofing Plants
Brick Machinery	Ledgerwoods	Rubber Plants
Brush Manufacturers	Loading and Unloading, Docks, Vessels and Wagons	Sand Suckers
Bulb Light Manufacturers	Lumber Industry	Ship Yards
Bulk Oil Stations	Milk and Egg Drying Machinery	Steam and Air Lines
Canning Industry	Milk Industry	Steam Shovels
Celluloid Products	Mine Pumps	Steel Mills and Furnaces
Cement Manufacturers	Moulding Machines	Sugar Refineries
Chemical Plants	Mud Guns	Testing Boilers
Cinder Ladles	Oil Lines	Testing Engines
City Street Sprinkling Wagons	Oil Refineries	Testing Pumps
Coal Mining	Ore Thawing	Tire Curing Machines
Die Casting	Paint Industry	Water Cooling
	Paper Mills	Water Works Intakes
	Plastic Plants	Water Works Piping
		Weed Burners



Barco Joints on "Oilgear" 30 Ton Axle Assembling Press

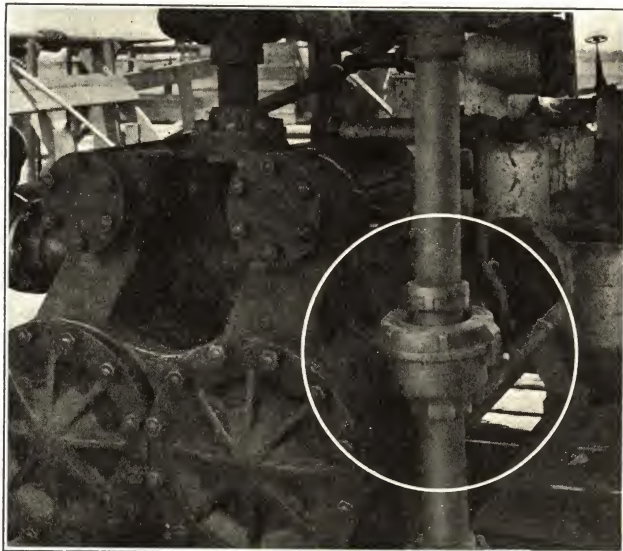




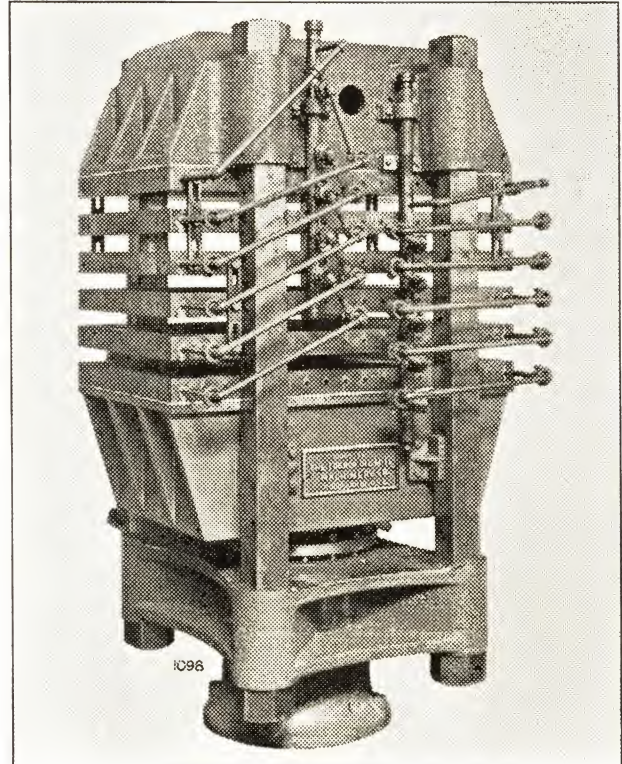
Barco Joints on Suction Dredges

## BARCO SWIVEL JOINTS

Swivel joints in sizes  $\frac{1}{2}$ " to  $1\frac{1}{4}$ ", inclusive, in malleable iron, ball joints  $\frac{1}{4}$ " to 3", inclusive, in malleable iron, and  $\frac{1}{4}$ " to 2", inclusive, in bronze, are suitable for 300 lb. per square in. steam pressure. Extra heavy malleable iron joints to 6" in the 7-8 and 7A-8 types are suitable for 350 lb. per square in. steam pressure. Barco joints are also furnished of special materials for special purposes. They are equally tight under suction or pressure and are suitable for all liquids.



Barco Joint on Rotary Mud Pump



Barco Joints on Platen Press

Barco Joints are used extensively in the rubber industry, on platen presses, hot molds for handling rubber solution, naphtha, gasoline and in many other places where a flexible connection is required. The Swivel Joints are particularly designed for use with alternating steam and cold water, being provided with a spring seat to take up expansion and contraction.



Barco Joints on Oil Loading and Discharging Docks



Type 7C-8C



Type 7-8A



Type 7-8B



Type 7A-8C



Type 7A-8



Type 7A-8B



# BAKELITE CORPORATION

247 PARK AVENUE, NEW YORK, N. Y.

CHICAGO OFFICE, 43 East Ohio Street

BAKELITE CORP. OF CANADA, LTD., 163 Dufferin Street, TORONTO, ONT., CANADA

WORKS at BOUND BROOK, N. J., RESEARCH AND DEVELOPMENT at BLOOMFIELD, N. J.

SALES OFFICES

CLEVELAND, OHIO

HARTFORD, CONN.

## PRODUCTS:

Phenol resinoid products, including molding materials; grinding wheel resins; cements; cast resinoids; laminated sheet, tube, and rod; a complete line of baking varnishes, enamels, and lacquers; also oil-soluble phenol resins for the production of quick drying, durable finishes which require no baking.

## BAKELITE:

Is the registered trade-mark for various materials manufactured by Bakelite Corporation, and products made from them.

## ENGINEERING SERVICE:

Intimate knowledge of thousands of varied applications of Bakelite Materials combined with twenty-four years' experience in the development of phenol resinoids for mechanical and industrial uses provides a valuable background for the co-operation offered by our engineers and research laboratories.

## MOLDING MATERIALS:

Heat hardening molding materials in powder form for hot molding. Must be molded in steel dies under pressure of approximately 2000 lb. per square inch, at temperatures of 285 to 350 degrees F. Average molding time 1 to 5 minutes.

The finished product is molded accurately to dimension, and comes from the die, lustrous in finish, and with complete reproduction of detail. Metal inserts can be molded exactly in place. Combines great dielectric and mechanical strength, with high heat resistance. Can be machined and polished. Is non-hygroscopic, impervious also to steam, oils, and solvents, and is chemically inert. Does not bloom, change color, or deteriorate with age. Used for electrical insulation and mechanical parts.

## IMPACT MOLDING MATERIALS:

Molding materials employing special long fibre fillers that give molded pieces of exceptional toughness and strength.

## ARC-RESISTANT MATERIAL:

A material specially suited for molding ignition parts of internal combustion engines. Has a low loss of resistivity under high temperatures.

## VARNISH:

A coating and impregnating varnish for electrical coils, windings, and insulation. High in dielectric strength and heat resisting. Impervious to oils, water, solvents, and most chemicals. Hardened by baking.

## ENAMEL:

An opaque coating to protect metal surfaces against corrosion and the action of chemicals. Effective as an insulating covering for metal parts on account of its dielectric strength, hardness, and resistance to heat.

## LACQUER:

A hard, transparent coating for highly finished metal. Resists solvents, gases, water, and perspiration.

## SYNTHETIC RESINS:

Oil soluble phenol resins for the manufacture of quick drying, durable finishes that require no baking.



REGISTERED  
TRADE-MARK

The registered Trade-Mark Symbol shown above distinguishes materials manufactured by Bakelite Corporation. Under the capital "B" is the sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

## CEMENTS:

Technical cements for lamp basing. Extremely hard, tenacious, and resistant to heat, solvents, and most chemicals. Require baking after application.

Also cement for bonding Bakelite Molded and Laminated to wood, porcelain, metal, and other materials. It requires no baking.

## SHEET, ROD, AND TUBE:

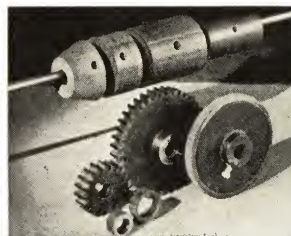
A laminated product manufactured from certain grades of paper and fabric processed with Bakelite varnish. Characterized by unusual strength, resiliency, and toughness.

Possesses high dielectric strength. Exceptionally resistant to heat, oil, water, and most chemicals. Will not warp or deteriorate with age. Can be machined and punched.

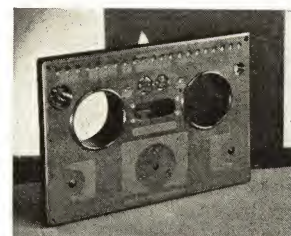
Used for a wide range of electrical and mechanical applications requiring maximum strength, high insulating quality, and heat resistance.

## SPECIAL MATERIALS:

Research laboratories are maintained by Bakelite Corporation for the development of new materials and the adaptation of standard materials to special applications.



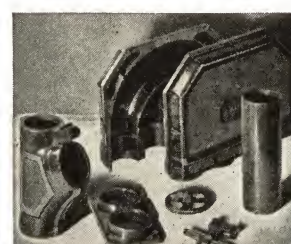
Gears and Blanks of  
Bakelite Laminated



Large Instrument Panel of  
Bakelite Molded



Handles and Knobs of  
Bakelite Molded



Bakelite Molded Parts for  
Pneumatic Tube System



Abrasive Wheels Bonded with  
Bakelite Resinoid



Terminal Insulators and Blocks  
of Bakelite Molded



## BARNES DRILL CO.

*Incorporated 1907*

819-837 CHESTNUT ST., ROCKFORD, ILL.

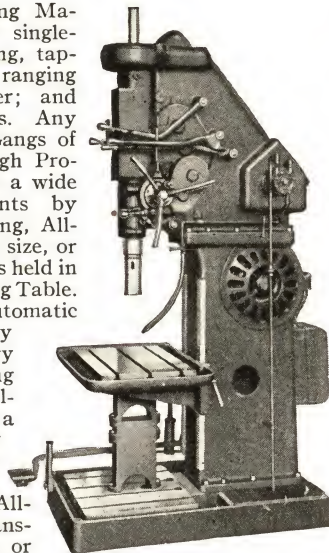
*Manufacturers of Self-Oiling- All-Geared Drilling Machines and Internal Honing Machines*

### DRILLING MACHINES:

Self-Oiling, All-Geared Drilling Machines are built in 8 standard single-spindle sizes for drilling, reaming, tapping, and kindred operations ranging in size from  $\frac{3}{8}$ " to 4" diameter; and boring or facing larger diameters. Any of these may be obtained in Gangs of two or more spindles. Our High Production Units are built to meet a wide variety of special requirements by mounting one or more Self-Oiling, All-Geared spindle heads of suitable size, or sizes, for operating on work pieces held in fixtures on our Hydraulic Indexing Table. These Units may have full-automatic cycle after starting, spindles may be equipped with our auxiliary machine-tool heads for operating on a number of work-pieces simultaneously at each station, and a loading position is provided for changing work-pieces while machining is in progress at the other stations. In Self-Oiling, All-Geared Machines power is transmitted from the drive pulley or motor through a powerful multiple disc clutch of our own design and manufacture, thence through hardened steel gears to the large spindle which has multiple integral splines. Anti-friction bearings of the most suitable type and design are used throughout. Forced lubrication is copious and complete and includes the drill spindle and sleeve in all but the sliding head models. In our single-purpose drilling machines, speeds and feeds are obtained through pick-off gears; in our quick-change types 4, 6 or 8 speeds and feeds are obtained instantly by the manipulation of conveniently placed levers. No. 242, with 8 quick-change speeds and feeds, is illustrated. Self-Oiling, All-Geared Drilling Machines have many exclusive patented features, and attachments, which promote accuracy, speed, convenience, and economy. Complete descriptions and specifications on request.

### INTERNAL HONING MACHINES:

Our company is one of the leading pioneers in finishing the interior of reamed bores or cylinders by honing. This method provides tool room accuracy on a continuous high production basis, improves the quality of many products and supplies them with additional selling features. These advantages are secured at remarkably low cost; lower, in fact, than can be obtained by any other method. Self-Oiling, Hydraulic Honing Machines are built in 11 standard vertical and 4 horizontal types. The smallest size is used for finishing cylinders from  $\frac{3}{4}$ " to 4" diameter and for lapping holes too small for the insertion of hones. We build service-type machines in which cylinders can first be bored or reamed and then honed. Our No. 214 Honer, illustrated, finishes multiple cylinders, up to 8 in number, simultaneously. Our larger vertical Internal Honers finish steam engine, air compressor, Diesel engine, and other cylinders up to 20" diameter by 54" long; our horizontal Internal Honers can finish larger and longer cylinders to meet any known requirement. In addition to being leaders in the art of finishing cylinders by Internal Honing, and building a complete line of machines for this purpose, we have extensive experience in designing work-holding fixtures which are especially important in honing, particularly in securing maximum production on multiple-cylinder work. Complete information and specifications about our Honing Machines will be supplied promptly on request. Correspondence is invited on the subject of applying Internal Honing to the manufacture of any products in which this process is not now used. The consulting services of our engineering department for the application of Self-Oiling, All-Geared Drilling or Internal Honing Machines is available without charge. Write for our *Catalog F*.



## BARNES-GIBSON-RAYMOND, INC.

6400 MILLER AVENUE, DETROIT, MICH.

DETROIT DIVISION  
6400 Miller Avenue

COOK SPRING DIV.  
Ann Arbor, Michigan

*Designers and Manufacturers of  
Springs, Wire Forms, Small Stampings*

### COMPRESSION SPRINGS:

In addition to compression springs from all sizes of wire, B-G-R also specializes in the manufacture of valve springs for all types of engines.



### EXTENSION SPRINGS:

Using all the best materials—spring steel, brass, bronze, monel-metal—as required. Special finishes—and special ends furnished to specifications.



### TORSION SPRINGS:

A fund of experience lies behind the manufacture of this type of spring. Full details of ultimate use are necessary to obtain proper performance.



### FLAT SPRINGS:

In the manufacture of flat springs, heat treating plays an important part. B-G-R has all the latest equipment for heat-treating, gas-fired or electric, automatically controlled.



### WIRE FORMS:

Most wire forms are made complete in one operation in automatic machines, tooling up for which has been carried to a point of utmost perfection.



### SPRING WASHERS:

All shapes and sizes can be quickly turned out by the automatic machinery at B-G-R. Many standard dies are available instantly to fill rush orders.



### SMALL STAMPINGS:

In addition to the foregoing, the machinery at B-G-R plants is adaptable to the production of all kinds and quantities of small stampings.

### DIE SPRINGS:

In the manufacture of these difficult springs, B-G-R uses nothing but the best electric furnace steel to withstand the extremely high stresses placed on them.

### ENGINEERING SERVICE:

A competent staff of experienced engineers is always available to help in the design of your spring requirements. Call on them at any time.

#### A VALUABLE NEW TREATISE ON SPRING DESIGN:

"Permissible Stress Range for Small Helical Springs" will be sent to you without obligation. Just mail your request to the Cook Spring Div. of BARNES-GIBSON-RAYMOND, INC., Ann Arbor, Mich.



# BARRETT, HAENTJENS & CO.

MAIN OFFICE AND WORKS: HAZLETON, PA.

*Manufacturers of Pumping Equipment for Every Service*

## BRANCHES

PITTSBURGH, PA.

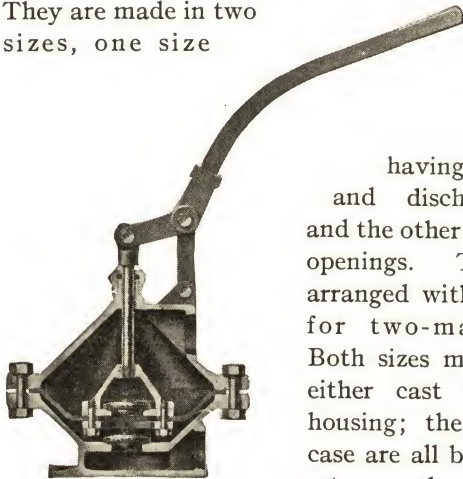
BIRMINGHAM, ALA.

ST. LOUIS, MO.

HOUGHTON, MICH.

### HAND PRIMERS:

The Hand Primers are of the diaphragm type for priming centrifugal pumps. They are made in two sizes, one size



Sectional View of Hand Primer

having 1½-in. suction and discharge openings, and the other size having 2-in. openings. The 2-in. size is arranged with double handle for two-man operation. Both sizes may be had with either cast iron or bronze housing; the valves in either case are all bronze. Can be set up alongside of pump or mounted on pump base

with permanent connections.

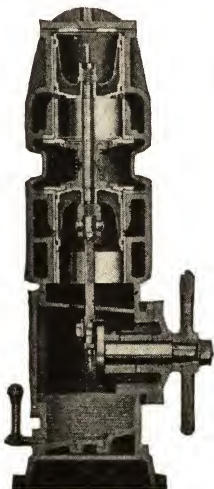
*Ask for Bulletin No. 515.*

### MOTOR-DRIVEN PRIMING PUMPS:

Dry vacuum type. Available in five sizes with capacities of 10, 15, 25, 50, or 100 cu. ft. of free air per minute. Motors are mounted directly on the frames of the 10 and 15-cu. ft. pumps. The large sizes are provided with cast iron base-plates for mounting the drivers. Power is transmitted by a completely guarded silent chain drive. General dimensions, power requirements, and weights are given in the table below.

These primers are suitable for priming centrifugal pumps that are either manually or automatically controlled.

*Ask for Bulletin No. 522.*



Sectional View of 50-Cu. Ft. Motor-Driven Priming Pump

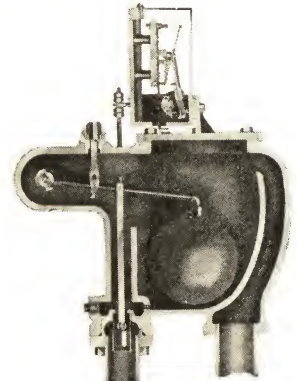
Size	Motor Req'd, Hp.	Floor Space, In.	Hgt., In.	Wgt., Lb.
10	1	16 (diam.)	24	300
15	1½	20 (diam.)	36	400
25	3	19 x 38	43	650
50	5	23 x 40	46	765
100	7½	41 x 42	46	1400

### VACUUM BREAKERS:

Prevent the entrance of water into the priming pump after the air has been drawn from the centrifugal pump and suction piping. Vacuum breakers can be furnished with or without switch. Either style may be used in manually attended stations, but switch fitted style must be used in automatically controlled stations. The switch is so arranged that after the centrifugal pump is primed, the primer is shut down and the main motor started.

In manual stations the switch can be used to signal the operator when the pump is primed and ready to be started.

*Ask for Bulletin No. 522 and 539.*



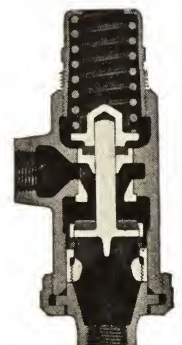
Vacuum Breaker

### PRIMING VALVES:

Open and close automatically and are used on both manual and automatically controlled pumps. Spring within valve keeps it normally open and pressure created by pump closes it. Valve remains closed as long as pump runs and opens when pump stops and loses its pressure.

Various designs of valves actuated either by the combined vacuum and pressure forces, produced by the pump, or by the second stage pressure of a multi-stage pump or by the vacuum produced by the priming pump are available. Certain conditions require a solenoid operated priming valve. Whatever the conditions, we have a suitable priming valve.

*Ask for Bulletin No. 550.*

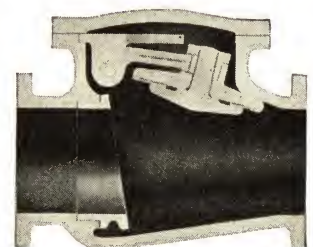


Priming Valve

### CHECK VALVES:

Hazleton check valves are intended for severe conditions where heavy, strong construction is essential. There are no small bolts, pins, etc., inside the valve. The interior parts can be lifted out of the body as a unit, by merely removing the valve cover.

*Ask for Bulletin No. 610.*



Interior View of Check Valve



## SWITCH FITTED CHECK VALVES:

The HAZLETON Type "M" Check Valve is equipped with a mercoide switch, either single-pole or two-pole. The mercoide is actuated by the valve flap so that when the flap is open the switch is closed.

When connected in series with the no-voltage release coil of the motor starter, this switch will stop the pump if for any reason it ceases to deliver water.

Thus the pump is protected against damage due to running without water.

The switch can also be used for operating an alarm signal, etc.

For mine service we recommend the Bulletin No. 610 check valve equipped with Cutler-Hammer Switch.

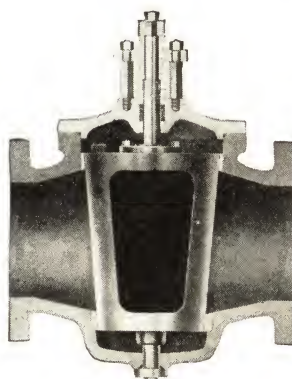
Ask for Bulletin No. 612.



Type "M" Check Valve



Interior View of Strainer



Plug Valve

## STRAINERS:

These strainers are very easily cleaned and can be placed anywhere in the suction line—directly onto the pump if desired.

The hand holes are closed by hinged plates and are of such size and so arranged as to permit easy access to the strainer.

Ask for Bulletin No. 605.

## PLUG VALVES:

Recommended for use on water lines where the usual gate valves wear out quickly, due to corrosive effect of the water. The plug valve is simple, easily operated, seats tightly, and outlasts a gate valve many times.

When the valve is open, in its usual position, every machined surface is covered and protected.

A valve may have been in service for years and yet its machined surfaces may be as perfect as they were when the valve was installed.

Ask for Bulletin No. 615.

## SUCTION LINE PRIMERS:

Automatic priming device with built-in check valve and strainer. Removes air from pump suction line, and acts only when air is present. Requires no extra motor for driving because the discharge column pressure serves to rid the air from the pump suction line.

Can be located at any convenient point in the suction line or, if desired, it can be connected directly onto the pump inlet flange. Suitable for manual or full automatic control.

Ask for Bulletin No. 530.

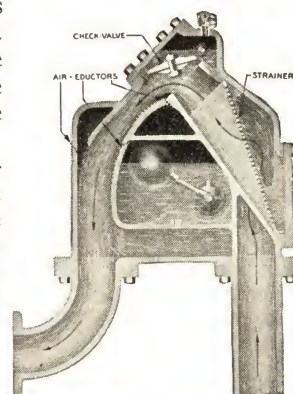
## PRIMING CHAMBER (Bulletin No. 577):

This chamber is in reality a priming valve and float chamber combined in a single unit. Its purpose is to expel any air that may accumulate in the system, and its switch can be arranged to start and stop either a priming pump or a centrifugal pump.

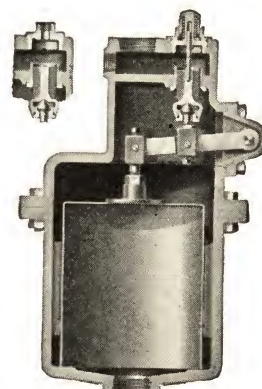
When used in conjunction with a vacuum pump and a tank, a constant prime can be maintained on one or more centrifugal pumps.

Especially suited for use with pumps handling sewage, in which case a fresh water connection is provided for flushing the working parts.

Ask for Bulletin No. 577.



Sectional View of Suction Line Primer



Sectional View of Priming Chamber

## AUTOMATIC CONTROL EQUIPMENT:

Automatically starts and stops a centrifugal pump when the water in the sump, reservoir, or tank reaches a predetermined level or when the pressure in the discharge or suction pipe rises or falls to a certain point. A pump can also be started and stopped by a time clock, push button, etc. Any mishap during operation such as blockage of intake pipe, loss of prime, or a break in discharge line, promptly causes stoppage of pump and sounding of alarm. The system is positive in action, and provides more complete protection than can be had with a pump runner on continuous duty.

The system is simple, all details are taken care of at the factory, and installation at the mine can be made by any competent electrician. Full instructions for connecting the various devices accompany every order.

Automatic Control eliminates costly damage caused by accidentally running the pump for a few minutes without water, and it assures most efficient operation of the pump at all times. Automatic pumping is already saving hundreds of thousands of dollars yearly for the mining industry.

Complete proposals will be submitted upon request.

## CENTRIFUGAL MINE PUMPS:

Made in sizes from 1½ to 12 in.; 1 to 8 stages. Capacities range from 100 to 5000 g.p.m. and heads from 10 to 1500 ft.

A large variety of pumps constructed of cast iron, bronze, or special alloys to suit all operating conditions are available.



## BARRETT-CRAVENS COMPANY

3274 W. 30TH STREET, CHICAGO, ILL.

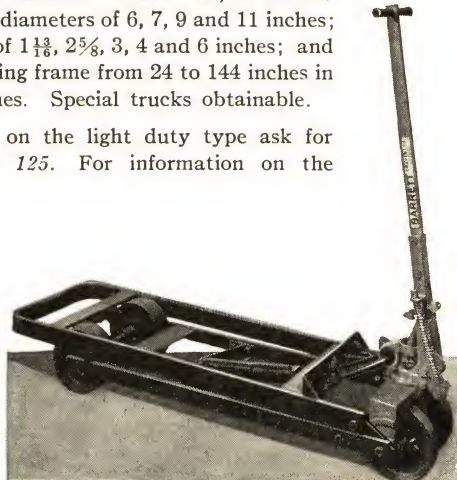
*Manufacturers of Hand Lift-Trucks, Lift-Truck Skids, Portable Elevators, Storage Racks, and Barrel Trucks*

### BARRETT LIFT-TRUCKS:

Barrett Lift-Trucks are available in either the single lift or multiple type. Both are guaranteed to lift easy and operate quickly. They will lift loads with a single stroke of the handle, or multiple strokes of the handle—and from an angle. Steel constructed throughout, except the wheels which are cast iron with chilled faces. Hyatt Roller Bearings employed in the light duty type, and Timken Roller Bearings employed in the heavy duty type. Alemite Lubricating System standard on all models.

Available in capacities of 2500, 3500, 5000, 6000, 8000 and 10,000 lbs.; three standard widths of 18, 24 and 27 inches; four wheel diameters of 6, 7, 9 and 11 inches; five lifting heights of  $1\frac{1}{8}$ ,  $2\frac{5}{8}$ , 3, 4 and 6 inches; and any length of carrying frame from 24 to 144 inches in multiples of 6 inches. Special trucks obtainable.

For information on the light duty type ask for *Bulletins 121 and 125*. For information on the medium and heavy duty type, ask for *Bulletin 123*. Our *Bulletin 124* is a sixty page picture book showing more than one hundred pictures of installations under varying conditions.



Barrett Lift-Truck

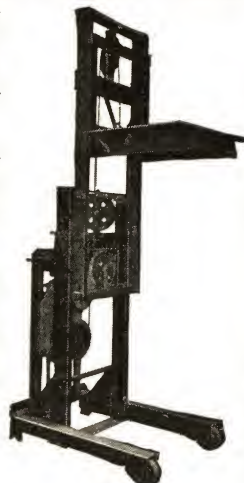
### BARRETT PORTABLE ELEVATORS:

Barrett Portable Elevators are available in capacities ranging from 500 to 5000 lbs.; hand or electrically operated; and with any piling height and size platform necessary to suit your needs. They can be had in either the hinged or telescopic construction.

For detailed specifications ask for *Bulletin 308*. For pictures of installations under various conditions, ask for *Bulletin 307*.

Light duty mechanisms are Spur Drive; medium duty mechanisms are Herringbone Drive; and heavy duty mechanisms are Worm Drive. All mechanisms are enclosed and running in oil—out of the dust and dirt.

Barrett features include:  
Governor Control  
Welded Construction



Barrett  
Portable Elevator

### PLATFORMS:

Barrett Steeple Platforms are made to work with any make of hand, electric or gasoline lift-trucks. Available in any size or capacity desired from either our Chicago or Newark, New Jersey, plant.

Ask for *Bulletin 251*.

### STORAGE RACKS:

Barrett Steel Storage Racks are built to accommodate barrels and drums, dies, skid platforms, reels, carboys and all other uniform size articles. Layouts and prices furnished upon application.

## THE BIGELOW COMPANY

Incorporated 1860

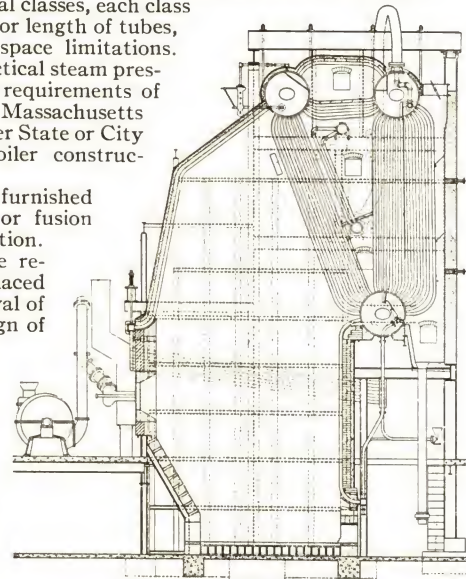
WORKS AND MAIN OFFICE  
76 RIVER ST., NEW HAVEN, CONN.

NEW YORK OFFICE: Graybar Building

### BIGELOW THREE-DRUM VERTICAL BOILER:

Offered in several classes, each class varying in height or length of tubes, to meet various space limitations. Made for any practical steam pressure to meet the requirements of the A.S.M.E., Massachusetts State Laws or other State or City ordinances for boiler construction.

Drums can be furnished either of riveted or fusion welded construction. Any tube may be removed and replaced without the removal of others. The design of the Bigelow Three - Drum Vertical Water Tube Boiler provides ample room for the use of practically any form of superheater desired. The arrangement of the heating surface is such that a furnace of proper shape and volume is readily designed to take care of the method of firing. The baffle arrangement is flexible and is dependent on furnace design and fuel used.



### BIGELOW-HORNSBY WATER TUBE BOILER:

This boiler is of sectional design, entirely tubed in our shops and built in units of 380 hp. to 3000 hp.

### BIGELOW LOW HEAD WATER TUBE BOILER:

Curved tube construction. The height is variable; the depth of setting increases for the different classes, giving a range from 75 hp. to 500 hp., any practical steam pressure.

### BIGELOW H.R.T. BOILER:

The advantages of compactness and efficiency, large direct heating surface, easy cleaning, large steam liberating surface, perfect circulation, minimum liability and easy repairs are well-known features of this type.

### BIGELOW ELECTRIC STEAM GENERATOR:

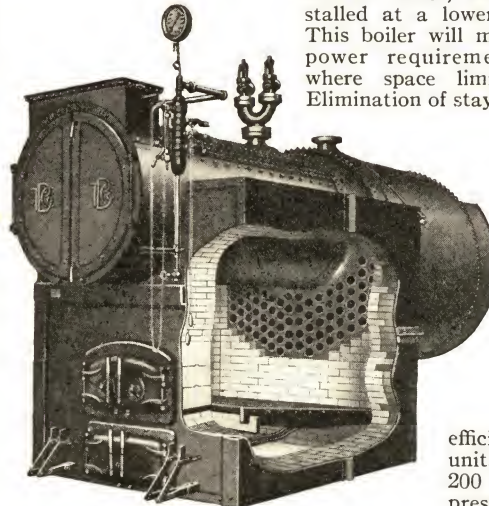
Generates steam from surplus electrical energy.

### BIGELOW SCOTCH MARINE DRY BACK BOILER:

Built in units from 15 hp. to 300 hp.

### BIGELOW TWO-PASS BOILER:

In designing the Bigelow Two-Pass Boiler all the resources of our many years' experience in designing and building steam boilers were drawn upon in an effort to develop a boiler containing the recognized features of the H.R.T. boiler, that could be installed at a lower complete cost. This boiler will meet heating and power requirements, especially where space limitations prevail. Elimination of staybolts and special



Bigelow Two-Pass Boiler

brick shapes in furnace reduces maintenance to a minimum. Large furnace volume, long gas travel, uniform velocity of gas over heating surface and low exit temperature assure maximum efficiency. Built in units from 25 hp. to 200 hp. for working pressures of 15 lbs. and 125 lbs.



# THE BARTLETT HAYWARD COMPANY

SCOTT & McHENRY STREETS, BALTIMORE, MARYLAND

*Manufacturers of Fast's Self-Aligning Flexible Coupling*

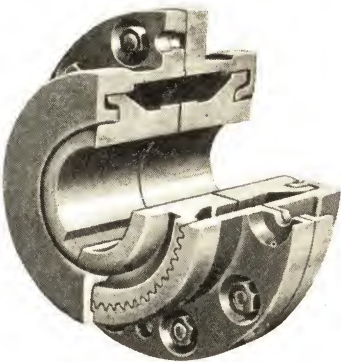
ATLANTA, GA. . . . .	1302 W. Peachtree St., N. E.
BIRMINGHAM, ALA. . . . .	321 Brown Marx Bldg.
BOSTON, MASS. . . . .	10 High St.
BUFFALO, N. Y. . . . .	487 Ellicott Square Bldg.
CHICAGO, ILL. . . . .	122 S. Michigan Ave.
CLEVELAND, OHIO . . . . .	325 Cornwall Road
DENVER, COLO. . . . .	Boston Bldg.
DETROIT, MICH. . . . .	402 Donovan Bldg.
FORT WORTH, TEXAS . . . . .	2603 Azle Ave.

LOS ANGELES, CAL. . . . .	912 E. Third St.
MONTREAL, CANADA . . . . .	Crescent Bldg.
NEW YORK, N. Y. . . . .	60 E. 42nd St.
OMAHA, NEBR. . . . .	6315 N. 33rd St.
PHILADELPHIA, PA. . . . .	73 Rochelle Ave.
PITTSBURGH, PA. . . . .	Koppers Bldg.
PORTLAND, ORE. . . . .	408 Board of Trade Bldg.
ST. LOUIS, MO. . . . .	3871 Delmar Blvd.
ST. PAUL, MINN. . . . .	Midway Office Bldg.
SAN FRANCISCO, CAL. . . . .	Call Bldg.

## FAST'S SELF-ALIGNING FLEXIBLE COUPLING:

Built in sizes from 1½-in. shaft up to huge steel mill reversing drives. Gives equally efficient results on low or high speed, light or heavy duty drives.

**Description:** This coupling is particularly designed for central stations, steel mills and wherever breakdowns and replacements must be eliminated. For that reason the flexibility is purely mechanical, no rubber, leather, fibre, laminated pins, springs, grids, discs or other flexible materials being used.



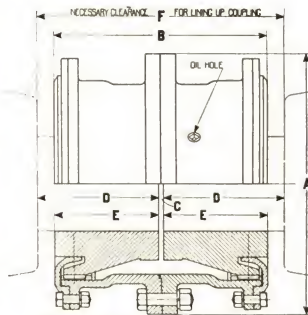
Section of Fast's Coupling

The shafts and sleeve revolve as one unit, errors in misalignment of shafts being taken up between the gear faces.

Oil under centrifugal pressure cushions the load, allowing for continuous, quiet operation at high or low speeds, on straight or reversing drives.

It is entirely enclosed, is dust-proof and will operate continuously where dust, dirt and dampness are unavoidable.

Two generated spur gears, one on each shaft end, are continually and completely meshed in oil with the internal gears of a floating sleeve.



Heavy Duty Type Coupling, Sizes No. 5½ to No. 12

**How to Order:** First—Divide the horsepower to be transmitted by r.p.m. and multiply this by 100. The result is the power to be transmitted in terms of hp. per 100 r.p.m.

Second—From the table of Utility Factors determine what class of service most closely resembles your service conditions and note the Utility Factor.

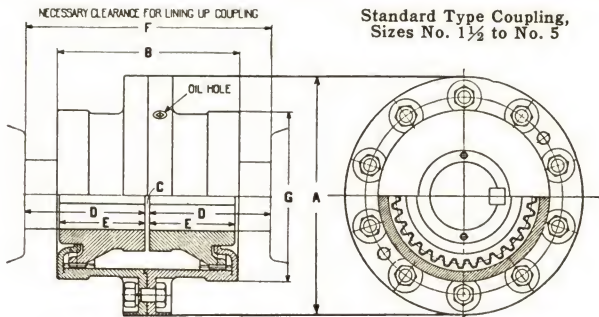
Third—Multiply the hp. per 100 r.p.m. by this Utility Factor. The product of these two figures is the "Coupling hp." per 100 r.p.m. required.

Fourth—With the "Coupling hp." per 100 r.p.m. determined from the Table of Dimensions select the coupling which has a maximum bore large enough to receive the larger shaft to be connected. In the column headed "Hp. per 100 r.p.m." note the capacity of the coupling selected. The capacity should be equal to or larger than the "Coupling hp." per 100 r.p.m. as already determined. If the capacity is less a larger coupling must be selected.

## TABLE OF UTILITY FACTORS

Multiply the hp. per 100 r.p.m. by utility factor for required service. This is the "capacity hp. per 100 r.p.m." See dimensions table at bottom of page.

Kinds of Machines	Factor	Kinds of Machines	Factor
<b>STEAM TURBINE DRIVEN</b>			
Generator (even load) . . . . .	1.00	<b>ELECTRIC MOTOR DRIVEN, Continued</b>	
Generator (uneven load) . . . . .	1.50	Wood-working machinery . . . . .	1.50
Blower . . . . .	1.00	Ammonia compressors . . . . .	2.25
Centrifugal pump . . . . .	1.25	Air compressors . . . . .	2.50
Induced draft fans . . . . .	1.50	Rolling mills, steel, rubber, brass . . . . .	3.00
Line shaft through gears, ropes or belt . . . . .	1.50	Mine hoists, elevators, cranes, etc. . . . .	2.00
Triplex single acting pump through gears . . . . .	1.75	Ship propeller . . . . .	1.75
Duplex double acting pump through gears . . . . .	1.75	Rotary pumps or blowers . . . . .	2.00
Rolling mill through gears . . . . .	2.50	Belt and chain conveyors . . . . .	1.50
Ship propeller through gears . . . . .	1.50	Fourdriniers, dryers, calenders . . . . .	2.50
<b>ELECTRIC MOTOR DRIVEN</b>			
Electric generator . . . . .	1.50	<b>STEAM ENGINE DRIVEN</b>	
Blower . . . . .	1.25	Electric generator . . . . .	1.75
Centrifugal pump . . . . .	1.50	Fans and blowers . . . . .	2.00
Line shaft, direct or through reduced gears . . . . .	1.75	Centrifugal pump . . . . .	2.25
Triplex single acting pump . . . . .	2.00	<b>GAS OR OIL ENGINE DRIVEN</b>	
Duplex double acting pump . . . . .	2.00	Electric generator . . . . .	2.00
Pulp grinders, screens, beaters, etc. . . . .	1.75	Fans and blowers . . . . .	2.25
Crushers ball or tube mills, veneer hogs . . . . .	2.00	Centrifugal pump . . . . .	2.50
		Single acting pump . . . . .	3.00
		Double acting pump . . . . .	2.75
		Ship propeller . . . . .	2.50



Standard Type Coupling, Sizes No. 1½ to No. 5

## DIMENSIONS AND RATINGS OF FAST'S COUPLINGS

Size No.	Max. Bore, In.	Forged Steel		Dimensions, In.						Shipping Wt., Lbs.
		Capacity Hp. per 100 R.P.M.	Maximum Speed, R.P.M.	A	B	C	D	E	F	
1½	1½	9.5	12000	6	4 3/16	1/8	2 1/8	1 1/8	5 1/8	18
2	2	22.5	9300	7	5 1/8	1/8	3 3/8	2 1/8	6 1/8	34
2½	2½	43.8	7900	8 3/8	6 1/8	1/8	3 3/8	3 1/8	7 1/8	53
3	3	75.5	6800	9 1/8	7 1/8	1/8	4 3/8	3 3/8	9 1/8	82
3½	3½	120	6000	11	8 7/8	1/4	5 3/8	4 1/8	11	120
4	4	180	5260	12 1/2	10 3/8	1/4	6 1/8	4 3/4	12 1/2	175
4½	4½	250	4770	13 3/8	11 3/8	1/4	6 1/8	5 1/8	14 1/8	250
5	5	350	4300	15 1/8	12 3/8	1/4	7 1/8	6 3/4	15 3/8	350
Sizes above No. 5 are CAST STEEL, Heavy Duty Type										
5½	5½	410	2065	16 3/4	14 1/8	3/8	8 3/8	6 3/4	17 3/8	600
6	6	540	2000	18	15 3/8	3/8	9 3/8	7 3/4	19 3/8	650
7	7	850	1875	20 3/4	17 3/8	3/8	10 3/8	8 3/4	21 3/8	1050
8	8	1270	1750	23 1/4	20	3/8	11 3/8	9 3/4	24	1575
9	9	1810	1625	26	22 1/8	1/2	12 3/8	10 3/4	26 1/8	2100
10	10	2480	1500	28	24 1/8	1/2	14	12	28 1/8	2600
11	11	3300	1375	30 1/2	26 3/8	1/2	15 1/8	13 1/8	30 3/8	3150
12	12	4090	1250	33	28 1/2	1/2	15 3/8	13 3/8	32 1/2	4175

Data on larger couplings furnished on request.

## OTHER TYPES:

In addition to the standard couplings shown here there are available types especially designed for mill motors, paper jordsans, cut-out type, floating-shaft type and others, meeting practically every problem of misalignment met in power transmission.

## CATALOG:

Complete catalog gladly sent on request to our Baltimore or nearest office (see addresses above).



# THE C. O. BARTLETT & SNOW CO.

MAIN OFFICE AND WORKS  
6450 HARVARD AVE., CLEVELAND, OHIO

*Material Handling and Processing Machinery*

## BRANCH OFFICES

NEW YORK, N. Y., 30 Church St.

CHICAGO, ILL., First National Bank Bldg.

## AGENTS

BIRMINGHAM, ALA., Keiser-Geisner Engineering Co.

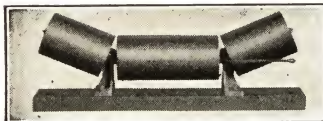
CANADA: Peacock Brothers, Ltd., MONTREAL, SYDNEY, WINNIPEG, TORONTO, CALGARY, VANCOUVER

## PRODUCTS:

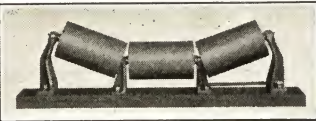
Conveyors and Elevators of all types; Skip Hoists; Dryers; Crushers; Coal; Coke and Ash Handling Equipment. Also Screens; Grizzlies; Car Hauls; Special Cars; Weigh Larries; Hoisting Engines; Feeders; Gates; Bunkers; Refuse Disposal Plants; Oil and Grease Extraction Plants; Paint Making Machinery.



Belt Conveyors Carrying Coal to Large Power Plant  
(Capacity 800 Tons per Hour)



Series 10 Belt Conveyor Idler



Series 40 Belt Conveyor Idler

## CONVEYING AND ELEVATING MACHINERY:

Built to operate perfectly regardless of service conditions Bartlett and Snow conveyors and elevators are of rugged construction. Each installation is skillfully engineered for the particular conditions to be met and furnished with guarantees of performance. Standard sizes include the following:

**Belt Conveyors:** Flat and troughed; widths 16 to 72 in.; two, three, or five-pulley types.

**Steel Apron Conveyors:** Five standard types; Capacities 30 to 640 tons per hour. For lump or granular material.

**Wood Apron Conveyors:** Widths from 10 to 48 in. for carrying boxes, bags, packages and for continuous assembly.

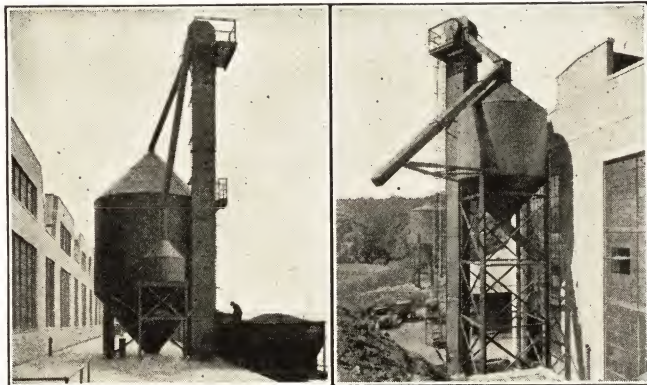
**Flight Conveyors:** Six standard types; capacities 410 to 11,800 cu. ft. per hour. For carrying material at any angle up to 30°.

**Screw Conveyors:** Sizes 4 to 18 in. diameter. Capacities 1 to 95 tons per hour. For grain, cement, fine coal, etc.

**Bucket Elevators:** Capacities 26 to 126 tons per hour. Buckets carried on belt or chain. For handling coal, rock, sand, etc.

**Centrifugal Discharge Elevators:** Seven standard sizes. Capacities 2 to 125 tons per hour. For elevating loose material when lumps do not exceed 3¼ in. in size.

*Special equipment for capacities up to 2000 tons per hour.*



Bucket Elevators

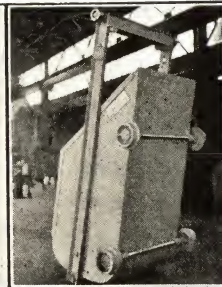
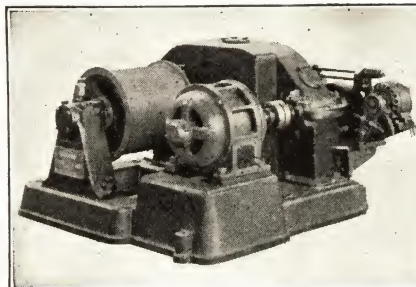
## SKIP HOISTS:

Furnished in semi-automatic and fully automatic types for all conditions.

Semi-automatic type completes a single cycle, bucket rises, dumps, returns and comes to rest in position, ready for reloading.

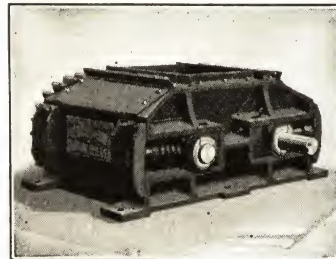
Fully Automatic type operates continuously without manual control, as long as there is material to handle.

Skip Hoists find greatest use in handling hot, abrasive or large material where the lift is high or the tonnage large. Rugged construction and low maintenance costs make Bartlett and Snow Skip Hoists unequalled for lifting coal, coke, ashes, ores and similar materials.



## CRUSHERS:

Single roll, two roll and four roll types for coal, with replaceable segments which permit the renewal of the crushing surface without installing new rolls. Capacity 25 to 750 tons per hour. Also Cycle Crusher Pulverizers of the standard swinging hammer type for reducing limestone, shale, slate, bauxite, zinc ores and similar materials to between 10 and 40 mesh. Capacities from 1 to 25 tons per hour.

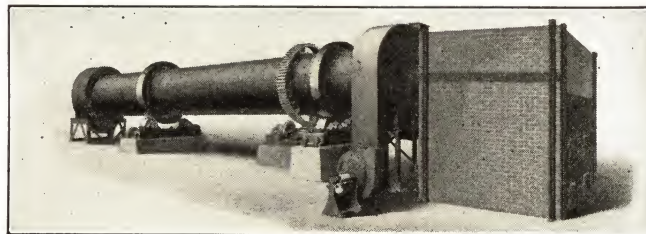


Write for *Bulletin 53*. It describes all types. Free on request.

## DRYERS:

Thirteen distinct types of mechanical dryers, each of which has a particular field of application, provides a standard type of dryer peculiarly fitted for your every requirement.

*Bulletin No. 69* describes all types. Free on request.



Style H Dryer



# BEACH-RUSS COMPANY

HUDSON TERMINAL BUILDING  
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Factory: BROOKLYN, N. Y.

Telephones: CORTLANDT 7-1115-1116

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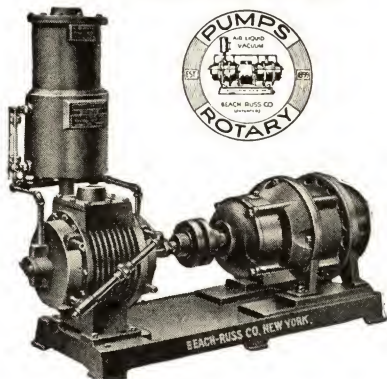
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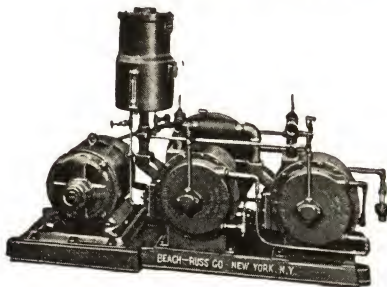
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## SINGLE STAGE HIGH VACUUM PUMP



Beach-Russ Type GHM Single-Stage High Vacuum Pump, 150 cubic feet per minute. "VAC-CHEM" Chemical Plant Type. Direct connected to gear-in-head motor. Vacuum within 1 mm. Other sizes from 6 to 400 cu. ft.

## COMPOUND HIGH VACUUM PUMP—TANDEM TYPE



Beach-Russ Type CHV Compound or Two-Stage Vacuum Pump. Tandem Style. Sizes 6 to 250 cu. ft. Vacuum within 1/2 MICRON. Operates either Single-Stage or Two-Stage, independently or simultaneously. "VAC-CHEM" Chemical Plant Type.

## ROTARY GAS COMPRESSORS

Maintain uniform delivery pressures regardless of fluctuating demand or gas supply. Used extensively for NEON, Radio Tube and Electric Lamp Plants, ovens, furnaces, etc. Supplied motor driven as shown, also pulley driven. With Automatic Pressure Control Valve. Capacities range from 60 to 30,000 cu. ft. per hour. Silent in operation.



## HIGH VACUUM FOR

EVAPORATORS DISTILLATION  
VACUUM FILTERING IMPREGNATION  
SOLVENT RECOVERY  
VACUUM DRYING DEHYDRATION  
LIQUID TRANSFER VACUUM FILLING

SINGLE-STAGE PUMPS, VACUUM 1 MM.  
TWO-STAGE, VACUUM 1/2 MICRON.  
TRENITE AND MONEL METAL TO  
RESIST WEAR AND CORROSION.  
NEW IMPROVED LUBRICATING SYSTEM  
WITH AUTOMATIC WATER SEPARATION.  
NO VALVES NOR SPRINGS.  
CAPACITIES TO 400 CU. FT./MIN.  
NOISELESS OPERATION.  
SMALL FLOOR-SPACE REQUIREMENTS.

BEACH-RUSS VACUUM PUMPS ARE  
ALSO ADAPTABLE FOR AIR AND GAS  
COMPRESSORS.

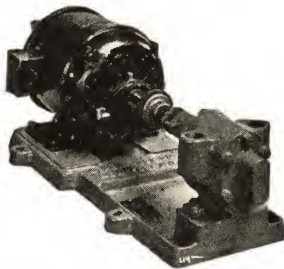
We have many special Sizes and Designs  
for adaptation to Automatic Machinery.

### SIZES AND CAPACITIES SINGLE STAGE PUMPS

Number	Capacity, Cu. Ft. per Minute	H. P. Size, Motor	Speed, RPM	Suction Pipe Size, Inches
1	6	1 1/2	600	3/4
1 1/2	9	3/4	600	3/4
2	15	1	600	3/4
3	28	2	385	1
4	45	3	385	1 1/4
5	60	5	335	1 1/2
6	75	7 1/2	335	1 1/2
7	110	10	275	2
8	150	15	260	2 1/2
9	225	25	200	4
10	400			6

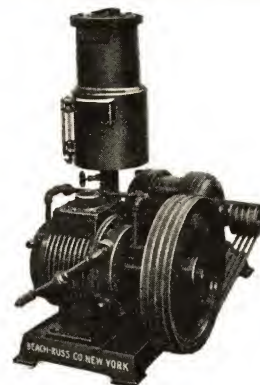
## ROTARY GEAR PUMPS

Quiet Operating Type



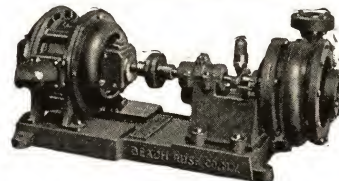
Beach-Russ Quiet Operating Rotary Gear Pumps, constructed with Herringbone, Spiral or regular Spur Gears. Furnished in all-iron, steel or bronze. Capacities 1 to 25 gallons per minute. Direct connected to motors through flexible coupling, or pulley-driven if desired.

## V-BELT DRIVEN TYPE



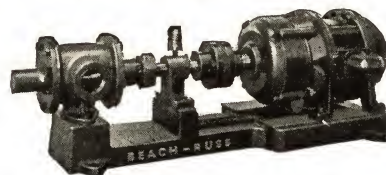
Beach-Russ Type SSVD Single-Stage Vacuum Pump, 225 cubic feet per minute. "VAC-CHEM" Chemical Plant Type, Multiple Strand V-Type Drive. Vacuum within 1 mm. Other sizes from 6 to 400 cu. ft.

## ACID RESISTING CENTRIFUGAL PUMPS



Cast SOLID of Resistant Metals and Alloys suitable for dilute and concentrated solutions of practically all acids or corrosive liquids. Open Impeller design eliminates clogging. Specially designed Stuffing Boxes to prevent leakage. Constructed of Stainless (Chrome) Iron, Hastelloy, Pure Nickel, Monel Metal, Antimonial Hard Lead, Acid Bronze, Trenite (for abrasion), Aluminum, etc. Single-Stage, Side Suction, Top Discharge Type, with all Thru-Bolt construction.

## ROTARY LIQUID PUMPS



Heavy Duty, Slow Speed, Rotary Type Pumps for pumping medium and heavy liquids. Furnished in all iron, steel or bronze, also in Sanitary types, arranged for easy cleaning and built of stainless alloys, etc. Capacities to 200 gals. Supplied steam jacketed for tar and all similar heavy viscous liquids. Direct connected units as shown, also supplied belt-driven, etc.

Also manufactured in Pure Nickel and Hard Rubber for pumping Vinegar, Cider, Mustard and similar products.

We also manufacture a complete line of Grinding and Pulverizing Machinery, Mixers, Sifters and Screens. Write for bulletins.



# BERNITZ FURNACE APPLIANCE CO.

89 BROAD STREET, BOSTON, MASS.

Branches in Principal Cities of U. S. and Canada

*Clinker-Proof, Air-Cooled and Water-Cooled Furnace Walls, Arches, and Floors*

## PRODUCTS AND SERVICES:

BERNITZ CO. PERFORATED AND BLANK AIR-COOLED WALLS AND FLOORS for coal and oil fired boiler furnaces, water gas generators, producers, etc.

BERNITZ CO. REFRACTORY COVERAGE FOR FURNACE WATER WALLS AND ARCHES.

*Clinker-Proof, Long-Life Furnace Wall and Floor Constructions.* "Carbofrax", silicon carbide, and high grade refractory clays. Suggested layouts applicable to particular conditions and competent supervision of installations are available when desired.

## BERNITZ AIR-COOLED FURNACE WALLS:

Bernitz Co. patented air-cooled blocks, either air-admission or blank type, provide a long life setting, with freedom from clinker adhesion,

# BERNITZ

TRADE-MARK

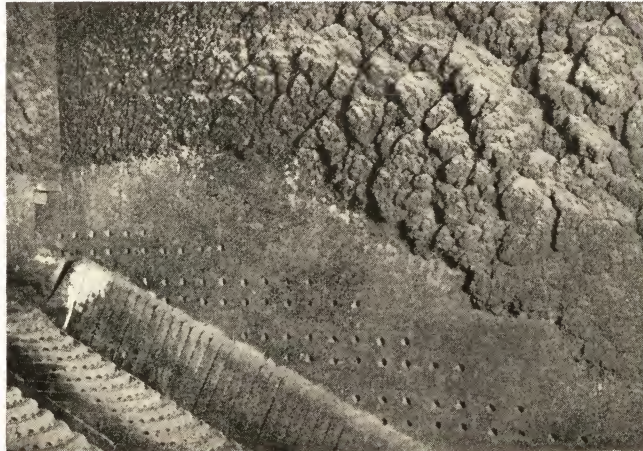


Fig. 1 Bernitz "S-100" "Carbofrax" Blocks

## STOCK BERNITZ AIR-COOLED SHAPES

S-100 Series "Carbofrax" Super Blocks						
Shapes		Air Apertures	Fire Face		Over All Depth	Shipping Wt., Each
Tee	U		Length	Height		
S-115	S-114	None	9"	7 $\frac{5}{8}$ "	7"	30 lbs.
S-117	S-113	2	9"	7 $\frac{5}{8}$ "	7"	30 lbs.
S-118	S-116	4	9"	7 $\frac{5}{8}$ "	7"	30 lbs.
S-119 for C.I. Anchor		4	9"	7 $\frac{5}{8}$ "	7"	30 lbs.
Half Block		2	4 $\frac{1}{2}$ "	7 $\frac{5}{8}$ "	7 $\frac{1}{2}$ "	15 lbs.
S-19 Grooved Stretcher		None	9"	2 $\frac{1}{2}$ "	4 $\frac{1}{2}$ "	10 lbs.
S-212 T. & C. Base Header		None	4 $\frac{1}{2}$ "	2 $\frac{1}{2}$ "	9 $\frac{1}{2}$ "	10 lbs.
Special Front Wall Tuyere Blocks between retort caps of standard stokers						
Standard Refractory Brick Shapes						
Acme Series "Silfrax" SiC Thrift Blocks						
Shapes		Air Apertures	Fire Face		Over All Depth	Shipping Wt., Each
			Length	Height		
A-9 Block		2 non-slagging	9"	7 $\frac{5}{8}$ "	6 $\frac{3}{4}$ "	20 lbs.
A-9B Block		None	9"	7 $\frac{5}{8}$ "	6 $\frac{3}{4}$ "	20 lbs.
A-10 Brick		None	9"	2 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	9 lbs.

slagging, and erosion difficulties.

Bernitz air-admission type of blocks are used extensively in forced draft stoker installations. Air from the stoker plenum chamber circulates to the perforated type air-admitting blocks, furnishing an exceptionally efficient and simple means of positive circulation. A small percentage of combustion air is discharged preheated into the sides of the fuel bed.

The oxidizing zone set up adjacent to the blocks materially reduces the severity of clinker and slag formations. Blank air-cooled blocks are used in locations where air admission might be detrimental to furnace efficiencies. See Fig. 1.

Bernitz Air-Cooled Fire Clay Blocks					
Shapes	Remarks	Air Apertures	Fire Face		Shipping Wt., Each
			Length	Height	
23	Tee	None	9"	7 $\frac{5}{8}$ "	30 lbs.
24	U	None	9"	7 $\frac{5}{8}$ "	30 lbs.
H	Not Recessed	9"	9"	7 $\frac{5}{8}$ "	38 lbs.
DH	60% Alumina	9"	9"	7 $\frac{5}{8}$ "	40 lbs.
Bernitz "Carbofrax" Air-Cooled Floor Tile					
S-79	9" x 4 $\frac{1}{2}$ " x 2 $\frac{1}{2}$ " deep—Tongued and Grooved on 4 sides				
S-249	9" x 9" x 2 $\frac{1}{2}$ " deep—Tongued and Grooved on 4 sides				
Bernitz Air-Cooled Super Water Gas Generator Linings					
Special air-cooled (perforated or blank type) circular, jamb and arch shapes of "Carbofrax" material stocked or made up for all sizes and types of water gas generators.					

## BERNITZ CO.'S "CARBOFRAX" WATER WALL COVERAGE

Either the Bernitz Co.'s Type "B" or Nygaard type of water wall refractory blocks may be entirely erected from the furnace side of new or existing water wall installations, without disturbing outer insulation and casing.

Bernitz Co.'s Type "B" water wall construction, Fig. 2, consists of steel lugs or ears welded to the sides of water wall tubes over which Type "B" Blocks individually hook on. Each block is thereby free to move with any tube movement and the weight of each block supported by inclined lugs hold the refractory firmly against the tubes.

Bernitz Co.'s Nygaard Water Wall Blocks, Fig. 3, interlock between contiguous tubes. The

blocks supporting each other on ramp-like planes are forced tightly against the tubes.

A few important features of Bernitz Water Wall Coverage are:

1. Erection or replacement is a simple, inexpensive operation with no construction in rear of tubes needing to be dismantled. No clamping devices are required.

2. "Carbofrax" material and designs which take care of expansion movement provide high heat transfer and durability to construction.

3. Uniform distribution of heat to large tube surface area improves water and steam circulation and prevents tube failures.

4. Blocks act as a thermal reservoir around tubes maintaining high temperatures in all parts of the furnace and efficient operation over wide range of ratings.

5. Constructions are applicable to vertical, inclined, horizontal and curved tube sections.



Fig. 2 Type "B" Water Wall Coverage

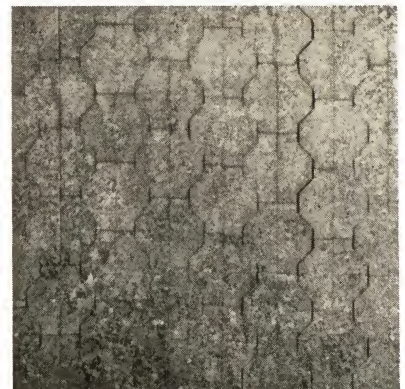


Fig. 3 Bernitz Coverage after 12 Months' Service



# BETHLEHEM STEEL COMPANY

GENERAL OFFICES: BETHLEHEM, PA.

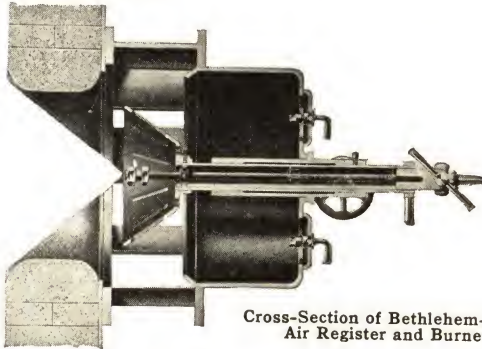
## PRODUCTS

BETHLEHEM-DAHL MECHANICAL-ATOMIZING OIL BURNING SYSTEM; GAS BURNERS; BETHLEHEM STEAM-ATOMIZING BURNERS for special furnace applications.

DUPLEX OIL SUCTION STRAINERS; DUPLEX OIL-DISCHARGE STRAINERS; MULTIPLE-COIL TYPE OIL HEATERS; ASSEMBLED HEATING and PUMPING UNIT SETS; MISCELLANEOUS OIL BURNER ACCESSORIES.

## BETHLEHEM-DAHL MECHANICAL-ATOMIZING OIL BURNING SYSTEM

For Boilers of 100 hp. rating and upward and for Driers, Furnaces, etc.



Cross-Section of Bethlehem-Dahl Air Register and Burner

The Bethlehem-Dahl System of burning fuel oil is based upon the mechanical atomization of oil, and does not require either steam or compressed air as an auxiliary atomizing agent. In this system the oil is first heated to properly reduce its viscosity, then forced under pressure through the burner, where the fuel breaks up into minute particles in a perfectly atomized conical spray which is thoroughly and completely mixed with air ready for perfect combustion.

## AIR REGISTERS

Bethlehem manufactures three standard types of air registers for furnaces of standard designs. Special registers will be made to suit unusual requirements.

The Bethlehem-Dahl Air Register with positive air control is of advanced design. It is of the extended type and is suitable for use with either natural or forced draft. The quantity and distribution of air necessary for complete combustion are under positive control at



all times. The amount of air admitted to the furnace is controlled by a single hand-wheel, located on the air register, actuating a rack-and-pinion that opens or closes the air inlet. Air ducts, formed by vanes uniformly distributed around the air register, carry the air evenly to all parts of the flame. When this register is used with forced draft, the air from the fans is led direct to the air intake.

## OIL HEATERS

The heater used in the Bethlehem-Dahl Mechanical-Atomizing Oil Burning System is of the multi-coil type. The steel coils through which the oil is pumped and heated are centered in a steel or cast-iron shell containing live steam. This arrangement allows the steam to circulate freely around the coils thus thoroughly heating the oil. Condensate is drained from the bottom of the heater and returned to the boiler-feed tank.

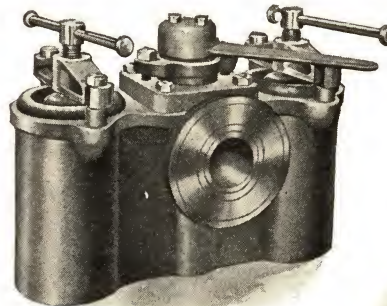


Bethlehem-Dahl Oil Heater

All oil connections are external to the shell, eliminating the possibility of oil leaks contaminating the steam and feed-water system.

## OIL STRAINERS

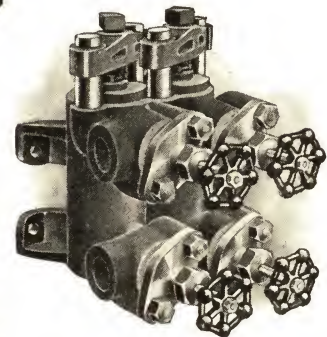
The suction strainer is made of cast iron and has two perforated baskets held in place by the covers. This duplex construction allows one strainer to be cleaned while the other is in operation.



Duplex Suction Strainer

The strainer baskets are large and have a straining area much greater than that of the oil-intake pipe.

The duplex discharge strainer is similar to the suction strainer except that it is equipped with valves instead of a plug cock.

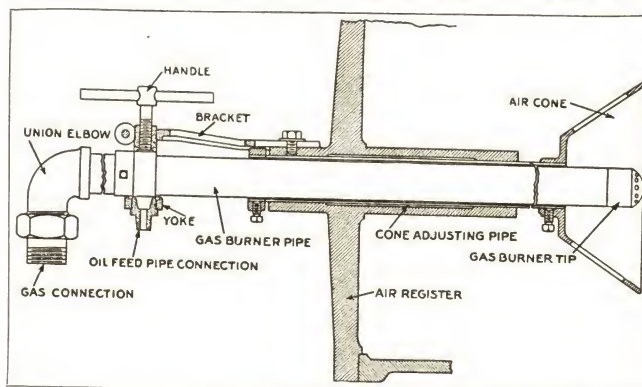


Duplex Discharge Strainer

## BETHLEHEM GAS BURNING SYSTEM

The conversion of the Bethlehem-Dahl Mechanical Oil Burning System from oil to gas requires only a few minutes. The oil supply is shut off, the handle loosened and the oil burner pipe removed. The gas burner pipe is then inserted and locked in position with the handle, ready for connection with the gas line.

When burning gas the amount of air admitted to



Cross-Section of Bethlehem-Dahl Furnace Front and Burner Converted to Burning Gas

the furnace for proper combustion is regulated by adjustment of the pot head with the hand wheel, in the same manner as when burning oil. This positive air control results in better combustion efficiency than is possible with the usual type of combination burner.

The Bethlehem Gas Burner operates at gas pressures of from about 1 to 12 pounds per square inch.



# BIGELOW-LIPTAK CORPORATION

2842 W. GRAND BLVD., DETROIT, MICH.

*A Suspended Arch and Suspended Wall for Every Furnace*

Sales Offices in Principal Cities

## PRODUCTS:

BIGELOW UNIT-SUSPENDED AIR-COOLED FURNACE WALLS.

BIGELOW UNIT-SUSPENDED BACKING WALLS.

BIGELOW UNIT-SUSPENDED FURNACE ARCH.

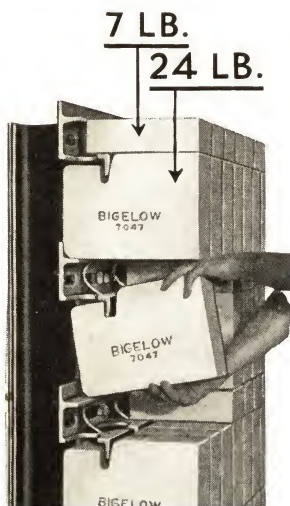
LIPTAK DOUBLE-SUSPENSION FURNACE ARCH.

LIPTAK SINGLE-SUSPENSION FURNACE ARCH.

LIPTAK TYPE X AIR-COOLED FURNACE WALL.

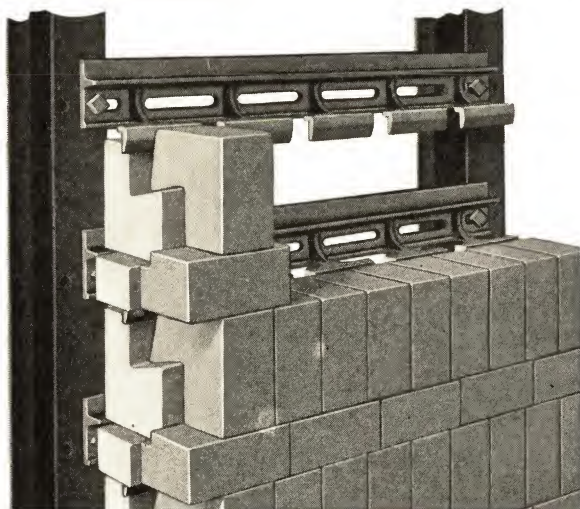
Customer's preference for brand of refractory can be accommodated because large stocks of our shapes are carried by the leading refractory manufacturers.

## BIGELOW UNIT-SUSPENDED AIR-COOLED FURNACE WALLS:



Showing Ease of Erection and Replacement of Blocks and Standard Fire Brick in the Bigelow Wall

turbing adjacent blocks—just slip out the two brick above and below the block and unhook it from the casting. This minimizes the amount of refractory used for replacement.



The Type "D" Wall Is Substantially the Same Construction as the Standard Bigelow Unit-Suspended Wall Except That It Substitutes a Double Course of Blocks for the Single Course; This, Incidentally, Permits Staggering All Joints in the Refractory. The Principal Application for the Type "D" Wall Is Furnaces Requiring an Inner Surface of Super-Refractory

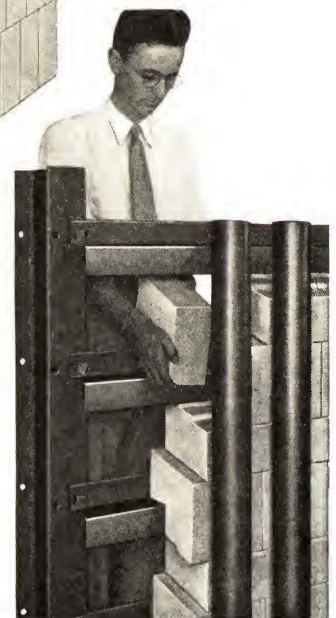
Every block in the standard Bigelow Wall is individually and positively supported directly from a bracket; it carries only the one standard fire brick directly above it. The maximum load supported by any refractory "unit" is 31 lbs.—the block itself weighs 24 lbs. and the brick 7 lbs. Because there is no cumulative loading on the refractory, one of the principal causes of spalling has been eliminated.

Repairs are seldom required but they are quickly and cheaply made because of the "unit" suspension principle. Any block can be replaced without disturbing

The supporting steel is unusually simple and completely shielded from the heat of the furnace. The wall can be placed vertically or sloped as desired without expensive supporting parts or complication of the structure. The sloping wall is particularly useful in forming an inward sloping upper front wall for bent tube boilers. In this application the wall is preferable to an arch design in many cases. The horizontal brackets lock the blocks firmly in place and prevent bulging of the wall. The supporting structure or metal grid acts as a cooling or radiating medium, cooling the refractory and insuring a much longer life, and practically eliminating the adhesion of slag. In pulverized fuel and underfeed stoker fired boilers this low slag adhesion is very noticeable.



The Type "LB" Backing Wall is another application of the Bigelow "Unit" Suspension Principle. It is easily removable from outside the setting. Each block is positively supported but may be quickly removed and replaced. There are no movable latches or hangers—just the fixed brackets which need not be disturbed when removing blocks. This wall has proved highly popular for the tube areas of boilers as well as for bare tube water walls. It is usually insulated with either plastic or slab type insulating material. Note the staggered vertical joints and broken horizontal joints.



## ENGINEERING SERVICE:

Furnace design and furnace requirements are today so varied that no one type of arch and wall construction is adapted to them all. Competent engineering service is available to help solve your furnace problems.

We are prepared to furnish all refractories—fire brick, high temperature cement, plastic fire brick—needed for furnace construction. This enables you to use carload freight rates.



# H. A. BRASSERT & COMPANY

310 So. MICHIGAN AVE., CHICAGO, ILL.

*Engineers and Contractors*

## ASKANIA AUTOMATIC CONTROL AND METERING SYSTEMS

The Askania system is designed to give extremely accurate regulation for a wide range of pressures, flows and temperatures. The regulating unit is the Askania jet pipe which operates without friction and inertia and is free from lag. The preferred application is always to metered regulation, and devices are available for steam, gases and liquids, including heavy oil.

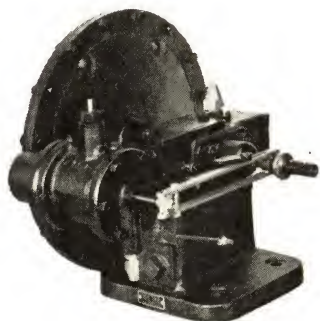


Fig. 1

The regulator is also equipped with an oil operated constant pressure stabilizer, whereby lag in the regulated system may be corrected without the variation in regulator setting, which exists with mechanical stabilizers. The extent of the delay in regulating action by means of which stabilization is effected is completely and instantly adjustable.

A peculiar feature of the Askania system is the ratio regulator shown in **Figure 2**. These regulators may be combined with each other so as to produce a completely automatic regulation of any desired number of conditions. The ratio may be instantly varied by a hand adjustment.

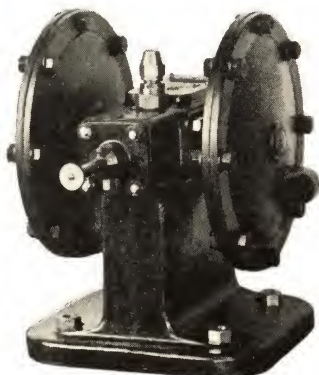


Fig. 2

The Askania regulator body is standard and adapted for use of various metering systems. One of these, a combination of diaphragm and sylphons for metering flow of liquids, is shown in **Figure 3**. A variety of other metering systems is available. Any of these may be used in combination with any other in the ratio regulator.

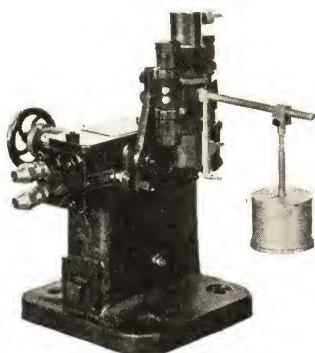


Fig. 3

In **Figure 4** is shown a standard potentiometer used as a metering system for an Askania regulator. An impulse of pressure varying with the temperature is communicated to the jet. All the Askania technique

of regulation and of stabilization against the lag which usually characterizes a heat system is thus made available for difficult problems of heat regulation.

In any given application the Askania regulator will be designed with particular reference to the problem at hand. Its simplicity, lightness, freedom from friction and wear and its strong construction make it particularly suitable for industrial use.

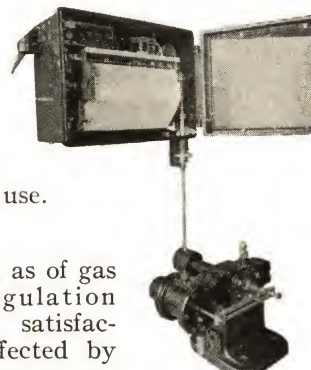


Fig. 4

Under certain conditions, as of gas

flow, regulation may be satisfactorily effected by positioning a correctly designed valve. For satisfactory results,

however, it is essential that the position of the valve shall correspond exactly to the regulating force. Where this regulating force is applied to the upper side of the diaphragm of a regulating valve, regulation is affected by the balance of the valve, by stuffing box friction and diaphragm characteristics. In the **True Stroke Regulator**, shown in **Figure 5**, all these factors are eliminated and the valve takes a position in true accordance with the regulating force. A second regulator of this type, mounted on a panel board, may act as a remote master, thus permitting an exact air



Fig. 5

operated remote setting of a valve or of valves in parallel.

The ring balance flow meter shown in **Figure 6** has particular application in furnace work with gaseous fuels. It is characterized by extreme simplicity, by ability to operate through an exceptionally wide range and by unusual accuracy. The unit is made indicating, recording and integrating.

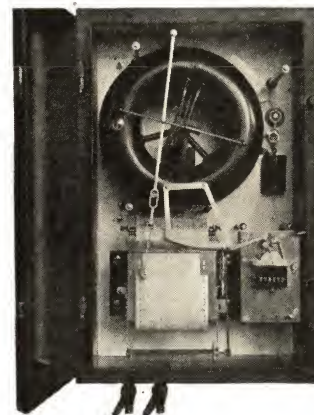


Fig. 6

The Askania system of regulation has had a long and successful use in Europe where its premier position is unquestioned. It is built entirely in U. S. A. in accordance with American modifications of the original designs.



# THE BRISTOL COMPANY

WATERBURY, CONNECTICUT

*Pioneers in Process Control since 1889*

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THE BRISTOL COMPANY OF CANADA, LIMITED, 64 Princess St., Toronto, Ontario, Canada

Ammeters (Recording)  
Boiler Water Level Gauges (Recording)  
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Control Valves (Electric Motor or Diaphragm Motor Operated)  
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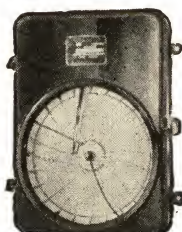
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Also both Electrically and Air-Operated types of Control Equipment for Temperature, Pressure, Liquid Level and Humidity.

## BRISTOL'S RECORDING PRESSURE AND VACUUM GAUGES:

For securing continuous records of pressure or vacuum. For steam, air, gas and liquids. Charts furnished to read in pounds, ounces, inches, feet, metric or any desired unit. For ranges from full vacuum to 12,000 pounds per square inch.



Model 40M



Model 41

## BRISTOL'S RECORDING LIQUID LEVEL GAUGES:

For automatically recording depths or levels of water or other liquids in tanks, water towers, reservoirs, etc. Instruments can be located where most convenient, either at a higher or lower level than the liquid to be measured.



Model 40M



Model 240M

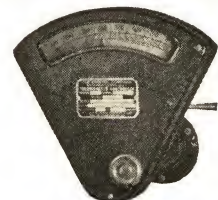
## BRISTOL'S RECORDING THERMOMETERS:

For all commercial ranges from  $-60^{\circ}$  to  $+1000^{\circ}$  F. Furnished with plain bulbs for use in open spaces such as dry kilns, etc. Bulbs with union and screw connections are supplied for recording temperatures of liquids in closed spaces under pressure, such as boiler feed water, superheated steam, milk pasteurizers, etc.

## BRISTOL'S ELECTRIC OPERATED CONTROL:

For automatically controlling temperatures to  $3000^{\circ}$  F. in connection with gas, oil or electrically heated ovens, furnaces, kilns, etc.

Motor Operated Control Valves available for gas, oil, steam, water; also relays, switches, etc., for electric heat.



Model 277B

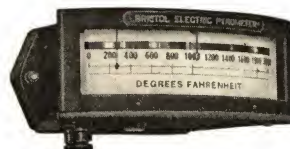
Thermometer Thermostat Controller available for temperatures to  $1000^{\circ}$  F. Thermo-Electric Pyrometer Type of instrument used for ranges up to  $3000^{\circ}$  F.



Model 478

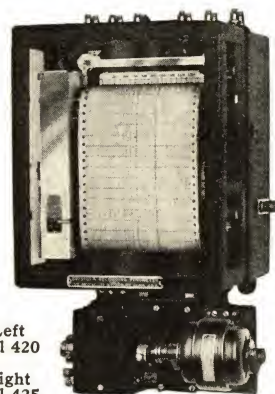
## BRISTOL'S INDICATING AND RECORDING ELECTRIC PYROMETERS:

High Resistance Indicating Model 420 has a long scale for easy reading, used for indicating temperatures up to  $3000^{\circ}$  F. Furnished as required, with base metal or platinum thermocouple.



At Left Model 420

At Right Model 425



Recording Pyrometer, having strip chart, will furnish a continuous record for 15, 30 or 45 days, according to speed desired. A feature of this instrument is the cold-end compensator which is standard equipment on all Bristol Pyrometers.

## BRISTOL'S AUTOMATIC AIR OPERATED CONTROL EQUIPMENT:

Bristol's Air Operated Free Vane Recorder Controller, Model 5240M, gives precisely the control which the temperature record indicates.

Controller action is full floating. Under the influence of temperature fluctuations the ingenious Free Vane device utilized for effecting control actually floats from one position to another. It does no mechanical work. It experiences no resistance or friction. Temperature indications are accurate. There is no distortion, either at, above, or below the control temperature.

Model 6035

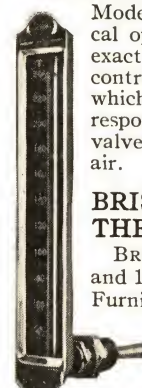


Model 6035



Model 5240M

Bristol's Air-Operated Process Time Cycle Controller, Model 6035, automatically regulates the mechanical operation in recurring process cycles on an exact time schedule. It provides precision time control of the several steps in any process cycle in which governing mechanisms can be made to respond in a definite sequence to diaphragm valves or other devices actuated by compressed air.



Angle Form

## BRISTOL'S INDUSTRIAL THERMOMETERS:

Bristol's Industrial Thermometers in 9-inch and 12-inch bronze cases for ranges up to  $1000^{\circ}$  F. Furnished in straight and angle form to take care of usual installation requirements—for either  $\frac{3}{4}$ -inch or 1-inch pipe thread connections in fixed thread, union connection or separable socket form.



Straight Form



# THE BROWN INSTRUMENT COMPANY

4496 WAYNE AVENUE, PHILADELPHIA, PA.

Cable Address: "BROWNSON" Philadelphia

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HOUSTON, TEX.  
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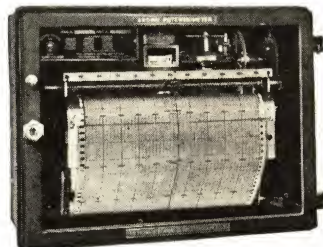
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ST. LOUIS, MO.  
SALT LAKE CITY, UTAH  
SAN FRANCISCO, CAL.  
TULSA, OKLA.

Distributors in Most Foreign Countries

## POTENTIOMETER PYROMETERS

For indicating, recording and controlling temperatures up to 3000°F. Operate on the potentiometer principle. The e.m.f. of thermocouple is balanced automatically against a known potential.

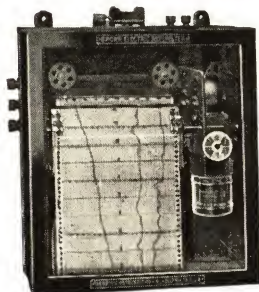


Movement of suspension type galvanometer directs mechanism driven by synchronous motor.

**Models:** Indicators, Recorders producing from one to six records on 12-in. chart. Automatic control or signalling.

**Features:** 40-in. slide wire, humidity compensator, combines ruggedness with extreme accuracy. Over 50 features—*Catalog 1101.*

## MILLIVOLTMETER PYROMETERS



For indicating, recording and controlling temperatures up to 3000°F. Operate on the millivoltmeter principle. The e.m.f. of thermocouple causes galvanometer to deflect and read temperatures directly.

**Models:** Indicators, recorders producing from one to twelve records on 7-in. chart. Automatic control or signalling.

**Features:** Automatic cold junction compensator, no dry cells, other features described in *Catalog 15B.*

## THERMOMETERS



For indicating, recording and controlling temperatures up to 1200°F.

**Principle:** Opening or closure of a tubular helix by expansion or contraction of a liquid, vapor or gas induced by temperature changes.

**Models:** Indicators, recorders, 8 or 12-in. circular chart; 1, 2, or 3-pens; strip chart recorders, single or duplex record; automatic control or signalling.

**Features:** Include fifteen constructional features. For details see *Thermometer Catalog 6702.*

## ELECTRIC FLOW METERS

For indicating, recording and controlling flow of steam, air, oil, gas and other fluids. Operate on inductance bridge principle.



U-tube, modified by six different range tubes for varying one leg of the U to meet the different flow ranges; together with adaptation of the electrical inductance bridge for transmission of motion from the meter body float to the instrument.

**Meter Bodies:** Range for differential pressures from 0.217 in. of water to 16 in. of mercury, working pressures up to 5000 lbs.

**Models:** Indicators, recorders, 12-in. circular chart with or without integrator and planimeter; Strip chart recorders producing one or two records. Automatic control or signalling.

**Features:** Distant operation, 6 range changes, automatic planimeter, accuracy unaffected by voltage changes. Other features explained in *Catalog 2003.*

## MECHANICAL FLOW METERS

For indicating, recording flow of steam, air, oil, gas and other fluids where electricity is not available.

**Principle:** U-tube, modified by six different range tubes for varying leg of the U to meet different flow ranges together with linkages for direct connection between float and meter mechanism.

**Meter Bodies:** Ranges for working pressures up to 2500 lbs. to measure differential pressures up to 16 ins. of mercury.

**Models:** Indicators, recorders, 12-in. circular chart, with or without integrator and planimeter. With pressure or temperature pens or both, automatic compensation for pressure or temperature.

**Features:** 6-range changes, square root or evenly divided chart, automatic planimeter, large float. For full information see *Catalog 2003.*



## CO<sub>2</sub> METERS

For indicating and recording % CO<sub>2</sub> content in mixed gases.

**Principle:** Relative thermal conductivity of CO<sub>2</sub> to air.

**Models:** Indicators, recorders, producing one to six records on 7-in. chart; duplex recorder records per cent CO<sub>2</sub> and temperature of flue gas.

**Features:** Write for *Catalog 3004.*



## PRESSURE AND VACUUM GAUGES

For indicating, recording and controlling pressure ranging from a few inches of water up to 5000 lb., or vacuum up to 30 in. of mercury.

**Principle:** Opening or closure of a tubular helix by pressure. In case of low pressures a diaphragm is used in place of helix.

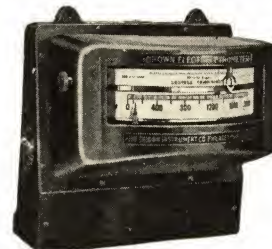
**Models:** Indicators, recorders, 8-in. or 12-in. circular chart; 1, 2 or 3-pens; strip chart recorders, single or duplex record; automatic control or signalling.

**Features:** For details see *Brown Gauge Catalog 6702.*



## AUTOMATIC CONTROLS

Brown instruments are supplied for automatically controlling temperatures, pressures, flows and liquid levels. Instruments indicate or record while they control. Write for *Catalog 8008.*



## OTHER BROWN INSTRUMENTS

Resistance Thermometers (*Catalog 9001*); Liquid Level Gauges; Remote Type Instruments (*Catalog 7501*).

## CATALOGS

Special Brown Catalogs are available describing the various Brown Instruments and will be promptly sent on request.



# BUFFALO FORGE COMPANY

495 BROADWAY, BUFFALO, N. Y.

"Air Engineers for Over Fifty Years"

## BRANCH OFFICES

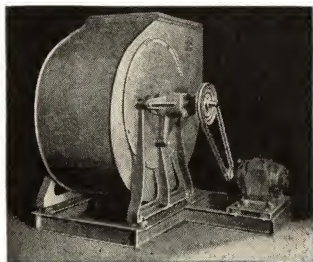
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DALLAS . . . . . Buffalo Engineering Co., 315 South Harwood, G. R. Thornton  
DENVER, Hendrie & Bolthoff Mfg. & Su. Co., 1621 Seventeenth St.,  
H. V. Waterman  
DETROIT, The Coon de Visser Co., 2051 West Lafayette Blvd., E. W. Shaver  
GREENVILLE . . . . . P. O. Box 563, G. R. Morgan  
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KANSAS CITY . . . . . 217 Dwight Bldg., L. R. Chase  
KITCHENER . . . . . Canadian Blower & Forge Co. Ltd., A. S. Capwell  
WILKES-BARRE . . . . . Power Engineering Corp., Coal Exchange Bldg., C. Ide

KNOXVILLE . . . . . P. O. Box No. 2224, C. F. Sexton  
LOS ANGELES . . . . . 610 Pershing Sq. Bldg., Hill St. at Fifth, P. R. Adrianse  
MELROSE . . . . . P. O. Box No. 71, E. D. Johnson  
MEMPHIS . . . . . 134 South Second St., A. W. Shelby  
MINNEAPOLIS . . . . . 619 Foshay Tower, E. F. Bell  
NASHVILLE, Southern Sales Co., 117 Fifth Avenue North, P. R. Jarratt  
NEW ORLEANS . . . . . P. O. Box 705, A. C. Hays  
NEW YORK . . . . . 39 Cortland St., Room 1110, W. S. Koithan  
PHILADELPHIA . . . . . 220 South 16th St., 703 Cunard Bldg., L. C. Davidson  
PITTSBURGH . . . . . 912 Fulton Bldg., H. L. Moore  
SAN FRANCISCO, 550 Fifth St., Herberts Moore Machy. Co., J. G. Scott  
ST. LOUIS . . . . . 1596 Arcade Bldg., J. W. Cooper  
SALT LAKE CITY . . . . . Salt Lake City Hdq. Co., W. H. Trask, Jr.  
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TOLEDO . . . . . 1817 North 13th St., C. M. Byster  
WASHINGTON, Commercial Nat'l Bank Bldg., 14th and G Sts., N. W.,  
Mezzanine Floor, G. S. Frankel  
Pittsburgh, Pa. . . . .

## PRODUCTS

HEATING AND VENTILATING EQUIPMENT, including: Unit Heaters, Multi-blade Fans, Pipe Coil Heaters, Buffalo Air Washers, Buffalo Unit Air Washers, Buffalo Unit Coolers, Drying Equipment, Mechanical Draft Fans, Air Preheaters, Exhaust Fans, Blowers, Dust Collectors, Disc Fans, Spray Nozzles.

### BUFFALO "LIMIT-LOAD" CONOIDAL FANS With Silent Floating Base



The engineer who is interested in fan performance gets a thrill out of this combination—the new Buffalo "Limit-Load" high-efficiency, non-overloading ventilating fan, mounted on the latest development of Buffalo engineers—the silent, insulated floating fan base. (Patents applied for.) Wherever you have a job that requires a quiet fan—specify and insist upon the "Limit-Load." And—where you want an outfit as nearly

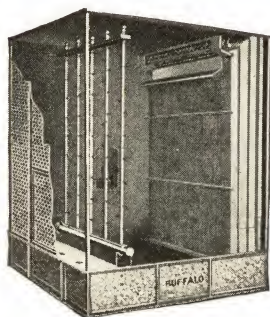
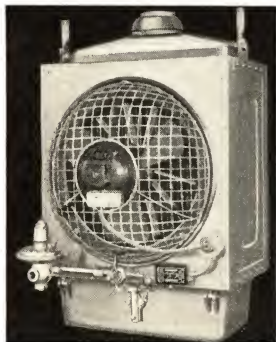
noiseless as possible—install a "Limit-Load" on a Buffalo Silent Base and you have absolutely the last word in efficient, silent ventilation.

### BUFFALO UNIT HEATERS

You can have efficient Buffalo Unit Heaters in any type building because we build several styles and can recommend the one best suited.

**Gas Units:** Made in suspended and floor types, two sizes each. Total capacity, 75,000 to 450,000 B.t.u. input per hour. All models, equipped with full automatic safety features. Advantages are: low first cost, by eliminating boiler room, fuel storage, auxiliary equipment and necessity for fireman or engineer; easy installation; cleanliness; automatic control; etc. Write for bulletin.

**Steam Units:** Both suspended and floor type units in a large range of capacities and with centrifugal or disk type fans.



Showing Interior Construction

### BUFFALO AIR WASHERS

Buffalo Air Washers' outstanding features are: eliminators in one piece and demountable; spray nozzles, non-clogging; suction screen extends entire width of tank; maximum contact between air and water spray. A complete line of self-contained unit air washers is also available.

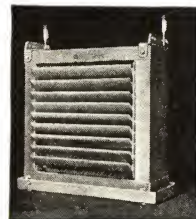
### BUFFALO UNIT COOLERS

To meet the requirements of various types of installations Buffalo engineers have designed three distinct types of unit coolers. These are:

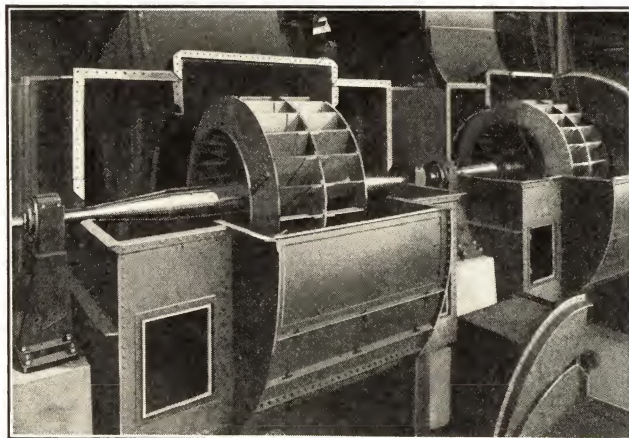
**Suspended Type:** (SC) has copper coils suitable for cold water, brine, methyl chloride and freon. Type SS units have steel coils for use with ammonia. Compact, simple, inexpensive. Capacities from 470 to 3280 c.f.m.

**Floor and Flat Suspended:** Available for same kinds of refrigerants, but with capacities from 2130 to 6480 c.f.m. Quiet in operation—easy to install.

**Comfort Conditioners:** (Type CC) Have two extended surface copper coils—one for steam or hot water for heating in cold weather, the other for cold water, brine, methyl chloride or freon. "Comfort Conditioners" are made in 2, 4 and 6 ton cooling capacities. Neat in appearance, almost silent in operation, require only 20 inches headroom. Details in *Bulletin No. 2904*.



### BUFFALO FORCED AND INDUCED DRAFT FANS



Installation of Buffalo Induced Draft Fans Being Set Up

High efficiency Buffalo Forced and Induced Draft Fans are in use in many of the most modern super-power stations, as well as in thousands of industrial power plants. Buffalo features include stronger and better-balanced rotors for higher peak loads, welded construction, liners, improved bearings and "limit load" feature which prevents motors from overloading.

### BUFFALO SLOW SPEED MILL EXHAUSTERS

For conveying shavings, sawdust, grain, cotton, all sorts of abrasive dust, bark and similar materials. Housings adjustable to either hand and to any angle of discharge. Self-aligning oil ring bearings give long operating life.

### BUFFALO VOLUME FANS

Cast iron construction, for handling smoke fumes and dust, ventilating, forge and furnace blowing, etc. Heavy dust-proof ball bearings. May be used as blower or exhaustor.

### BUFFALO BREEZO FANS

For all exhausting and ventilating service where no duct work is required. Made in a complete range of sizes. All-steel construction, with fully enclosed self-lubricating motors.



# BUFFALO PUMPS, INC.

495 BROADWAY, BUFFALO, N. Y.

*Manufacturers of Better Pumps Since 1887*

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INDIANAPOLIS, Milburn Engineering Co., 4302 N. Capitol Ave., R. F. Milburn  
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KITCHENER . . . . . Canadian Blower & Forge Co. Ltd., A. S. Capwell  
LOS ANGELES, 610 Pershing Sq. Bldg., Hill Street at Fifth, P. R. Adrianse  
MELROSE . . . . . P. O. Box 71, E. D. Johnson  
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NEW YORK . . . . . 39 Cortland St., W. S. Koithan  
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PITTSBURGH . . . . . 912 Fulton Bldg., H. L. Moore  
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TOLEDO . . . . . 1817 North 13th St., C. M. Eyster  
WASHINGTON, Commercial Nat'l Bank Bldg., 14th and G. Sts., N. W.,  
Mezzanine Floor, G. S. Frankel

Complete Line Manufactured in Canadian Branch by  
CANADA PUMPS, LIMITED, KITCHENER, ONTARIO

## PRODUCTS

A complete line of STEAM PUMPS, SINGLE and MULTI-STAGE CENTRIFUGAL PUMPS, POWER PUMPS and SPECIAL PUMPS for special purposes, etc.

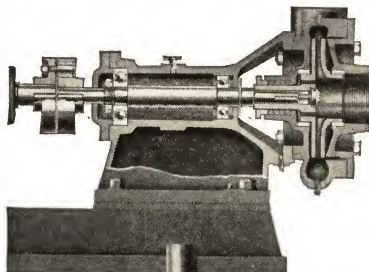
Descriptive literature furnished on request.

### BALL BEARING SINGLE SUCTION PUMPS

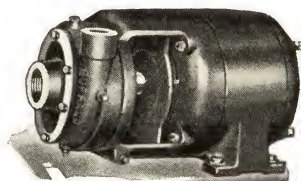
The finest single suction pump we've ever built, this recent model is a high efficiency unit designed to combine the good points of a dozen earlier types.

Ball bearings used are oversize, and have sufficient capacity to take care of speeds up to 5000 R.P.M. Built-in labyrinth seal at outer face of each bearing protects it against entry of foreign matter. Bearings are spaced to take care of overhung impeller construction without setting up vibration in the shaft.

Pump ends can be made inexpensively of special alloys such as pure nickel, stainless steel, Illium, acid bronze or other metals. Numerous features are combined in this line of pumps. May we give you full particulars.

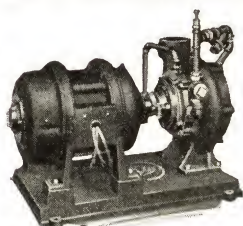


### CLOSE-COUPLED SINGLE SUCTION PUMPS



This pump is identical with the full ball bearing model described above, except that it is close-coupled to electric motor. Impeller is overhung on the motor shaft, providing a compact, easily serviced unit.

### BUFFALO SELF-PRIMING SINGLE AND DOUBLE SUCTION CENTRIFUGAL PUMPS



All Buffalo Single and Double Suction Centrifugal Pumps can now be had with positive self-priming device built with the pump, under license from the Nash Engineering Company, and fully covered by patents. It is identical in design with the Nash primer, and will give

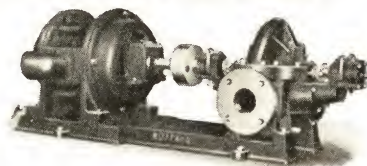
absolute satisfaction.

Constant positive prime obtained without foot valves.

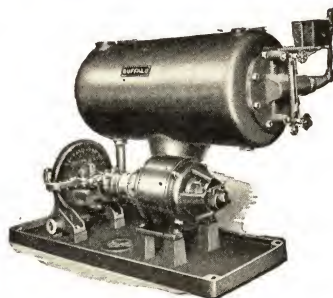
## SPECIAL BUFFALO CENTRIFUGAL PUMPS

We manufacture heavy stock pumps for paper mills, process plants, etc., as well as acid pumps made of special acid resisting metals, and pumps for handling very hot liquids.

Be sure to get our recommendations before buying pumps for any special service.



## CENTRIFUGAL CONDENSATION OUTFITS

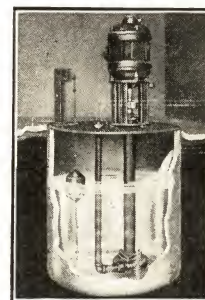


Consist of pump and receiver with automatic float switch and strainer. They handle condensate at 212° F. without being affected in any way, and give the same efficient service regardless of temperature of water. Due to this effective handling of very hot water, these pumps op-

erate with low thermal losses. Cast iron receiver, copper ball float. Self-contained. Entirely automatic. Also made with steam pump.

## BUFFALO SUMP PUMPS

"Buffalo" Sump or Bilge Pumps are entirely self-contained and automatic in operation. Equipped with large ball thrust bearings, with automatic lubrication. Shaft entirely enclosed. Stuffing box and gland at cover plate prevent foul odors rising into room.



## BUFFALO STEAM PUMPS

"Buffalo" Piston Packed Steam Pumps are suitable for boiler feeding and general service for pressures up to 200 lb. Handle hot or cold water.

## BUFFALO UNDERWRITER FOOT VALVES

Built in strict accordance with specifications of the Underwriters and are approved by them. They are suitable for use with either centrifugal or reciprocating pumps. Strainers not furnished as standard equipment, but can be supplied on special order. Have extra large valve areas, and are built for pressures up to 125 lbs. Sizes from 6 to 24 in.



# THE BURT MANUFACTURING CO.

605 MAIN ST., AKRON, OHIO

*Manufacturers of Roof Ventilators, Oil Filters, Oiling Systems, Storage Tanks and Exhaust Heads  
Sheet Metal Work of All Kinds from Specifications (12 to 28 Gauge)*

## ROOF VENTILATORS:

The various types of Burt Ventilators, which include a size and a type for every condition, have resulted from more than thirty years' experience in the ventilating of factories, foundries, hotels, schools, public buildings, etc., by Burt Engineers.

Burt Ventilators are made in standard sizes from 6 to 72 inches in the types shown on this page. Details on Rectangular, Weave Shed and other types available on request. Absolutely no black iron is used in any Burt Ventilators. Ordinarily they are made from prime open hearth galvanized steel, but they may be made from zinc, copper, lead clad sheets, Toncan metal, Armco iron, aluminum or monel metal at slight additional cost. All Burt Ventilators are guaranteed against defects in material and workmanship throughout their life.

## NEW DIRECT-CONNECTED BURT FAN VENTILATOR:

This new drive eliminates, all belts, idlers and pulleys and can be furnished in any electrical characteristics that you have available. Motor fully enclosed and protected against damaging action of fumes and vapors. Composition motor mounting makes operation practically noiseless. Positive in action where conditions are severe. Can be furnished with explosive-proof motors. Operates as the best gravity type when motor is turned off. Sizes 14 to 60 in., inclusive.

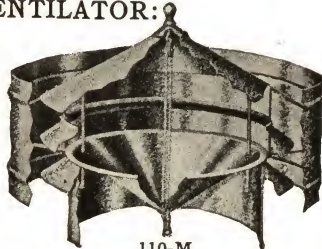


100-M

## BURT CONE DAMPER VENTILATOR:

This type features the extra-wide wind band which gives it a tremendous pulling power and the inverted cone damper which aids greatly in guiding the vitiated air outward.

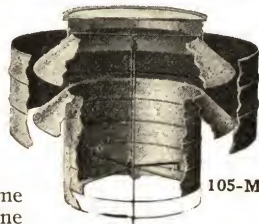
No cross braces or obstructions in neck or air shafting. Additional space between bottom louver and top of ventilator makes for maximum efficiency. Can be fitted with fusible link which automatically closes ventilator in case of fire. Patented fastening clip obviates the necessity of tying the chain to nails or hooks in the building. Meets requirements of insurance companies and Underwriters' associations.



110-M

## BURT SLIDING SLEEVE DAMPER VENTILATORS:

The patented damper in this ventilator consists of a sliding (telescopic) sleeve, which provides an open and unobstructed air shaft and makes it possible for the ventilator to serve as a combination skylight and ventilator when made with the Glass Top as shown. When the skylight feature is not essential it can be equipped with a metal top. Same patented damper clip used as on Cone Damper Ventilator. No flat surface on damper for dust to collect and drop back into building.



105-M

## BURT REVOLVING VENTILATOR:

Neat, well constructed ventilator of the revolving type which is of the correct scientific design in every respect. Incorporates open back construction whereby air currents pass not only over top and sides, but also pass directly through the head creating partial vacuum in front of air shaft, greatly increasing pulling power. Equipped with two sets of high grade steel ball, Timken roller or any bearings specified. Positively guaranteed not to stick or bind. No louvers in head, consequently maximum efficiency is obtained. Fully erected and tested in factory before shipment.



115-M

## BURT OIL FILTERING SYSTEM:

In the Burt system the waste lubricating oil used in lubricating machinery often amounting to from 50 to 90% of the total used is gathered, and passed through the filter, purified and pumped to the reservoir if one is required. This process, constantly repeated, is automatic and requires little attention. The system can be installed very easily by any engineer.

We are prepared to furnish a system complete, including filters, reservoirs and pumps. They can be operated either as batch filters or continuous by-pass systems, or in connection with specific installations. Made for all services, including industrials, sugar mills, paper mills, rubber mills, rolling mills, mines, etc.

## NEW BURT UNIVERSAL UNIT FILTER:

The latest addition to the line of Burt Filters is the Universal Unit Filter which was developed for super-service stations where it is used to clean crankcase oil for use in oil burning equipment. However, it produces excellent results on practically any grade of oil. It has a high capacity for its size, filtering from 250 to 500 gallons per day and occupying only 4 sq. ft.

## CROSS OIL FILTERS:

Recommended for filtering engine and common machinery oils.

This filter is equipped with steam coils for thinning the oil, thereby facilitating filtration. If kept in a warm place this need not be used.

Ordinarily, cleaning is necessary about once every three or four months. This is very easily accomplished without interfering with the pure oil supply and can be done at a few cents expense per year.

Any type of Burt Filter can be used as dry filter, the water being eliminated. This is necessary for some work such as transformer and central station service.

Its filtering medium is high grade white waste, filter cloths, perforated screens and water. Capillary attraction being necessary before the oil passes into the pure oil reservoir, absolutely insures a clean product.

Information on Cross Filters, Style A, for large systems and Style B with water separating device, furnished on request.

## BURT UNIT TYPE OIL FILTER:

The Unit type provides a filter of any capacity desired, at the same time occupying a comparatively small space. Each unit can be used in connection with or independent of an oiling system.

This type can grow with your plant as units can be added when necessary. As units are added they are connected together and operated as one unit.

Filters can be furnished in any capacity from 5 or 10 gallons per hour to any desired amount. We have installations in operation filtering 28,000 gallons of oil per hour.

## AMERICAN OIL FILTER:

This filter is similar in construction to the Unit type with the exception that it is round in shape and has only one filter chamber.

It is intended for use in connection with gas and gasoline engines and is especially recommended for cleaning lard, cylinder and crank case as well as other grades of heavy oil.

Filtering medium same as the Unit type.

Information on specially built filters for engines of any kind sent on request.

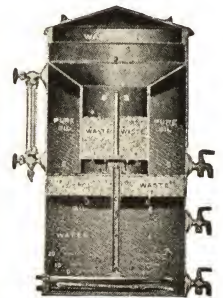
## EXHAUST HEADS:

We manufacture a Burt and a Standard Exhaust Head.

The Burt Head is constructed with perpendicular sides. This increases the inside area, thereby providing plenty of room for expansion of the steam without back pressure.

It has only one steam chamber—the entire head—with no baffle plates, no diaphragm, no scrap metal.

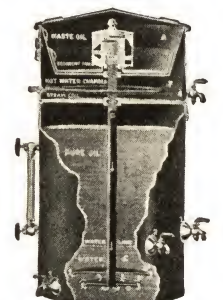
The Standard Exhaust Head is built for those who prefer to use centrifugal force for separating water and oil from exhaust steam.



200-M



201-M



202-M



# BUSCH-SULZER BROS.-DIESEL ENGINE CO.

ST. LOUIS, MO.

TWO RECTOR ST., NEW YORK

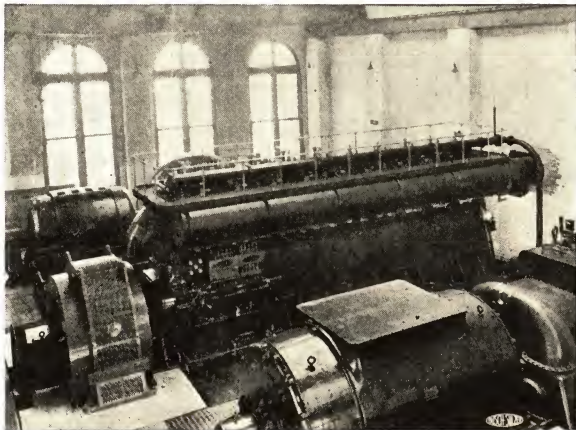
RIALTO BLDG., SAN FRANCISCO

*Manufacturers of Stationary, Marine and Locomotive Diesels, Two and Four Cycle Types  
High Pressure Compressors and Special Machinery*

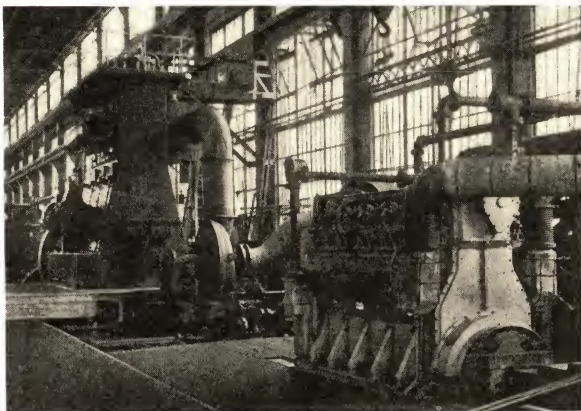


TRADE-MARK

The original, therefore the oldest, Diesel manufacturer in the United States, engaged in designing and building Diesel engines; with adequate technical staff and specially equipped Diesel works; guided in design, selection of materials, and workmanship by over thirty years of its own experience in building Diesel engines, both 4- and 2-cycle types, heavy duty, slow speed, special light weight high speed, including sta-

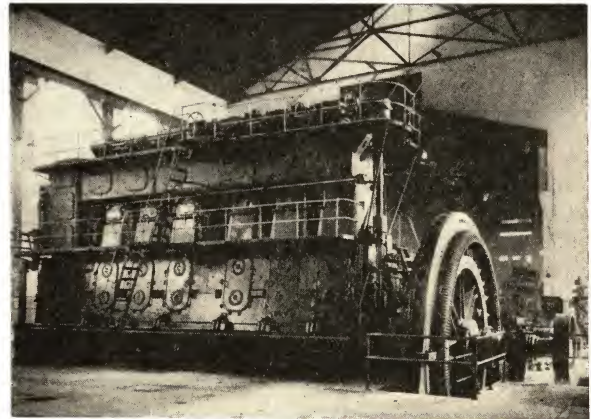


3000 BHP Trunk Piston Diesels in 15,000 KW Power Plant



Test Floor Busch-Sulzer Works, Dec., 1933  
30" Trunk Piston Diesel (left)  
"V-8" 1600 HP Locomotive Diesel (right)

tionary and marine reversing Diesels; under the direction of Dr. Diesel until 1913; by 15 years (1911-1926) of technical collaboration with the Swiss firm, Sulzer Brothers; and, at present, by the Engineering Research and Technical Advice of Allgemeine Elektrizitäts Gesellschaft, of Germany, builders of the first successful solid injection double-acting 2-cycle Diesel.



3900 BHP Two Cycle Cross Head Type  
with 2700 KW Flywheel Generator

## STATIONARY ENGINES

Four cycle, trunk piston, slow and medium speed. Sizes 225 to 1000 BHP.

Two cycle, trunk piston, medium and high speed. Sizes 875 to 10,000 BHP.

Two cycle, single acting, crosshead, slow speed. Sizes 1200 to 7000 BHP.

Two cycle, double acting. Sizes up to 15,000 BHP.

## MARINE ENGINES

Two cycle, double acting, direct drive. Sizes up to 15,000 SHP.

Two cycle, single acting, slow speed, direct drive. Unit sizes 600 to 10,000 SHP.

Two cycle, medium speed, direct and electric drive. Sizes 600 to 10,000 SHP.

Four cycle direct and electric drive. Sizes 300 to 1000 BHP.

Two cycle, high speed. Sizes up to 6000 BHP.

Special types to meet particular requirements.

## LOCOMOTIVE DIESELS

Two cycle "V" Type. Sizes 1600 to 3500 BHP.

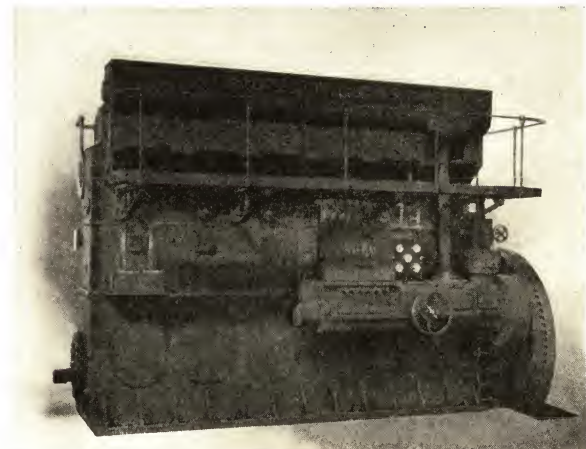
## OTHER PRODUCTS

Duo-presses for thermo-plastic molding.

High pressure air compressors.

Special compressors. Special high test grey iron castings.

C. I. high temperature melting pots. Special heavy machinery.



Six Cylinder, Four Cycle, 750 BHP



# THE CARBORUNDUM COMPANY

(Reg. U. S. Pat. Off.) (Trade-Mark)

REFRACTORY DIVISION

PERTH AMBOY, N. J.

DISTRICT SALES BRANCHES

CHICAGO

CLEVELAND

DETROIT

PITTSBURGH

PHILADELPHIA

AGENTS

BIRMINGHAM, ALA. . . . . L. F. McConnell  
EL PASO, TEX. . . . . Denver Fire Clay Co.  
LOS ANGELES, CAL. . . . . Pacific Abrasive Supply Co.  
NEW ORLEANS, LA. . . . . Christy Fire Brick Co.  
ST. LOUIS, MO. . . . . Christy Fire Brick Co.

SALT LAKE CITY, UTAH . . . . . Harrison & Co.  
SAN FRANCISCO, CAL. . . . . Pacific Abrasive Supply Co.  
SEATTLE, WASH. . . . . Pacific Abrasive Supply Co.  
MONTREAL, QUE. . . . . Williams & Wilson, Ltd.  
TORONTO, ONT. . . . . Williams & Wilson, Ltd.

SPECIAL REPRESENTATIVES FOR OIL REFINERIES

PHILADELPHIA, PA. . . . . Alcorn Combustion Co.

After years of extensive research and development in the use of silicon carbide as a refractory, the Refractory Division of THE CARBORUNDUM COMPANY was established in the year 1912. Early in 1919, the Refractory Division was transferred to a separate and well equipped plant at Perth Amboy, N. J.; this plant is the largest of its kind in the world devoted exclusively to the manufacture of super-refractories. All of the vast resources, experience, and facilities of THE CARBORUNDUM COMPANY are here combined to produce refractory materials of the highest type.

## PRODUCTS:

### Refractories:

"Carbofrax" and "Silfrax" (Carborundum Brand Silicon Carbide) and "Alfrax" (aluminum oxide) refractory brick, tile, special shapes, and high temperature cements.

"Refrax" (recrystallized silicon carbide) brick.

"Carbofrax", "Silfrax", and "Alfrax" kiln furniture, saggars, and bats.

Carborundum Brand Silicon Carbide grain.

Carborundum Brand Firesand.

"Infrax" insulating firebrick and cement.

"Alfrax" embedding cements.

"Firefrax" high temperature cements.

### Furnaces and Kilns:

"Carboradiant" Combustion Chambers.

(Reg. U. S. Pat. Off.)

Carborundum Company Recuperators (Licensed under the Fitch Patents).

## TRADE-MARKS:

"Carborundum", "Carbofrax", "Refrax", "Aloxite", "Silfrax", "Alfrax", "Firefrax", "Infrax", and "Carboradiant" are registered trade-marks of THE CARBORUNDUM COMPANY for products of its manufacture.

## ENGINEERING SERVICE:

In addition to manufacturing refractory materials, the Refractory Division of THE CARBORUNDUM COMPANY maintains a well organized furnace and refractory engineering department equipped to render engineering service to all operators of furnace equipment particularly relative to the use of super-refractories.

## CARBORUNDUM BRAND SILICON CARBIDE:

"Carborundum" is the registered trade-mark of THE CARBORUNDUM COMPANY for the material chemically known as silicon carbide. It is a product of the electric furnace, produced by the chemical combination of coke and silica sand at a temperature of 4000° F. This crystalline substance is not melted at any temperature up to its decomposition point, which is about 2240° C. (4064° F.). Above this temperature it dissociates into its elements, silicon and carbon.

Carborundum Brand silicon carbide has a thermal conductivity approximately ten times as great as that of fireclay, and much higher than that of any other commercial refractory material. It has a coefficient of expansion of .000005 per degree C. from 0° to 1500° C. It is extremely resistant to chemical action, being inert to nearly all reagents except basic substances at high temperatures.

## ALOXITE BRAND ALUMINUM OXIDE:

Aloxite Brand aluminum oxide is produced in an arc type electric furnace by melting bauxite. Upon cooling it crystallizes into a highly pure, dense form of aluminum oxide ( $Al_2O_3$ ) having a melting point higher than 2000° C. (3722° F.).

**"Aloxite"**

Trade-Mark  
Reg. U. S. Pat. Off.

## "CARBOFRAX" REFRACTORIES:

"Carbofrax" Refractories, being composed principally of Carborundum Brand silicon carbide, inherit the desirable properties of the latter, as indicated by the following data:

**"Carbofrax"**

Trade-Mark  
Reg. U. S. Pat. Off.

(1) **Refractoriness:** Sufficient to withstand temperatures in excess of 3000° F. without softening or oxidizing.

(2) **Spalling Tendencies:** "Carbofrax" has the lowest spalling tendency of any commercial refractory.

(3) **Average Cross Breaking Strength:**

Material	Modulus of Rupture, Lb. per Sq. In.	
	20° C.	1350° C.
"Carbofrax" Brick	2103	900
Silica Brick No. 1	608	145
Fireclay Brick	665	113
Magnesite Firebrick	1338	136

(4) **Thermal Conductivity:**

Material	Mean Thermal Conductivity in B.t.u. per Sq. Ft. per In. per Deg. F. per Hr. for Temperatures of 600° C.-1350° C.
"Carbofrax" (Carborundum Brand Silicon Carbide)	108
"Alfrax" (Aloxite Brand Aluminum Oxide)	23
Silica Brick	12
No. 1 Fireclay Brick	9

(5) **Contraction:** No contraction or shrinkage at any commercial temperature.

(6) **Resistance to Abrasion:** At least ten times greater than best grade of fireclay brick.

**"Carbofrax" Brick:** "Carbofrax" Brick are carried in stock in large quantities in all of the standard 9-in. series shapes, also in the more commonly used shapes of the 6 and 13½-in. series.

These brick are used extensively in all types of coal, oil, and gas fired furnaces and kilns to effectively resist flame impingement, high temperature, abrasion, clinker trouble, rapid change of temperature, and to transmit heat or carry severe loads.

Kiln fireboxes or supporting arches constructed of "Carbofrax" brick will render a degree of service that insures ultimate economy.

**"Carbofrax" Tile and Shapes:** Shipment from stock may be had on orders for approximately thirty different sizes of "Carbofrax" plain rectangular tile ranging from 12 x 12 x 1½ in. to 27 x 12 x 3 in. Non-standard sizes of plain rectangular tile and special shapes require only a few weeks for manufacture and delivery.

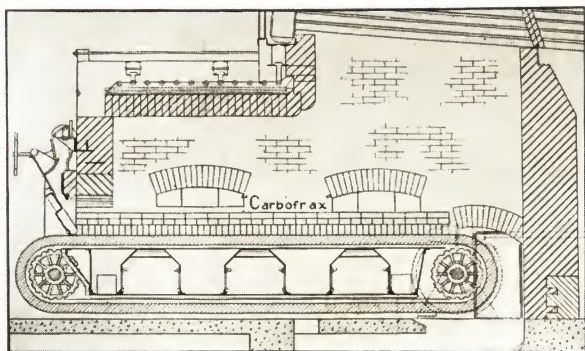


# THE CARBORUNDUM COMPANY

## "CARBOFRAX" IN BOILER FURNACES:

The trend in modern boiler and boiler furnace design has been toward increased steam production per unit, greater ease of operation, and greater durability, with reduced operating costs.

From the standpoint of the furnace this development has usually resulted in increased heat release per cubic foot of furnace volume, higher temperatures, and the imposing of more severe service conditions on the refractories necessary for furnace construction. Each specific type of furnace or fuel requires a special study of its refractory requirements. Only proper analysis of the conditions and correct specification and utilization of the materials of construction will result in a satisfactory installation. No one refractory material is capable of giving best results for the complete construction of any boiler furnace when ultimate economy is the objective.

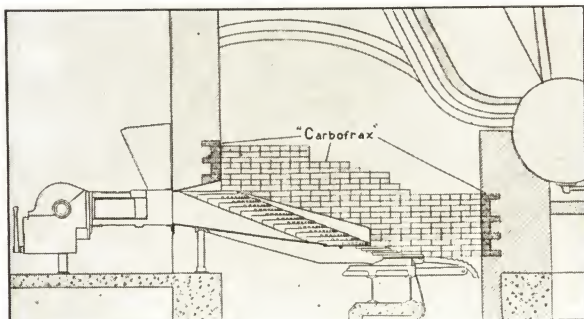


Recommended location for "Carbofrax" Brick with CHAIN GRATE STOKER. Installed as shown "Carbofrax" Brick eliminate clinker adhesion and abrasion along the grate line

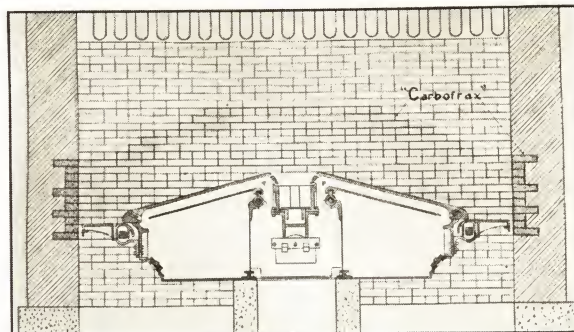
The Carborundum Company has specialized in the manufacture and manner of application of its refractory products in the power field. These products have been successfully used for boiler furnace construction for the past twenty years and their development has kept pace with the changes in requirements during that period. In practically every installation, regardless of type, they may be used to advantage in some location.

In most stoker and hand fired boiler furnaces the severest refractory service conditions exist in that portion of the walls in and immediately above the fuel bed. In this zone the refractories are subjected to the highest temperatures as well as mechanical and flame erosion. Furthermore, unless suitable materials are used clinker adhesion will occur resulting in destruction of the walls due to slice barring and reduction of furnace efficiency and capacity because of the decreased effective grate area caused by the building out of clinker.

"Carbofrax" is used in these locations for the complete elimination of trouble from these causes. Its refractoriness, great mechanical strength at high temperatures, freedom from spalling, and resistance to mechanical or flame erosion make it ideal for the purpose. Its impervious, dense surface prevents clinker adhesion.



Recommended construction and location for "Carbofrax" Brick in side, bridge, and front walls of MULTI-RETORT UNDERFEED stoker settings. Their use insures long life and positive elimination of clinker adhesion. Because of freedom from barring the usual shattering and breaking away of linings are eliminated, thus protecting the entire setting



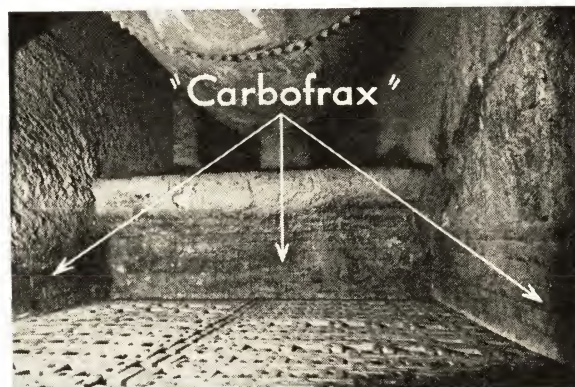
Recommended arrangement of "Carbofrax" Brick for lining single retort stoker settings. Severe service and clinker adhesion troubles are by no means confined to large boiler units. "Carbofrax" Brick are as useful in eliminating clinker adhesion and erosion in small installations as they are in super stations

Successful installations now numbering in the thousands are in operation today, testifying to the value of "Carbofrax" in such applications, and a useful life of four to five years is not exceptional under conditions causing the failure of fireclay refractories in as many months.

"Carbofrax" brick may be used to advantage in the wall zone of the fuel bed in any stoker or hand fired boiler setting regardless of the quality of the coal.

Above the fuel bed they may be used for resistance to high temperature and flame erosion when high grade coals are used, but they are not recommended in this location for coals having high iron content because of the fact that molten slags high in iron will react chemically with "Carbofrax", although "Carbofrax" resists the effect of iron slags to a greater extent than will fireclay. However, in such installations the high thermal conductivity of "Carbofrax" is utilized by air or water cooling to prevent this action.

The recommended location and proper construction for the use of "Carbofrax" brick in non-cooled furnace linings based on actual experience with such installations is illustrated.



"Carbofrax" Brick in HAND FIRED Boiler Furnace Lining. In this installation "Carbofrax" has given an average life of four years as compared with six months for fireclay, formerly used. Lining costs have been reduced 60 per cent and during their useful life in this and four other similar boilers "Carbofrax" has saved this user \$3425.00 as compared with former costs with fireclay. Certified performance data supplied on request

## THE CARBORUNDUM COMPANY RECUPERATOR:

This type of recuperator built under the Fitch patents, employs "Carbofrax" as the heat transmitting medium utilizing the high heat conductivity of this material. The air passages consist of "Carbofrax" refractory tubes and through their use a maximum of efficiency in heat recovery is secured. The Recuperator design embraces several novel features such as: Accessibility of essential parts for inspection and repairs, reduction of leakage possibilities to a minimum, and means for producing turbulence and preventing stratification. This recuperator is highly suitable for use with continuous or intermittent furnaces.



## CARRICK ENGINEERING CO.

835 E. EIGHTH ST., MICHIGAN CITY, IND.

*Combustion Control Specialists since 1916*

Representatives in All Principal Cities

### PRODUCTS

Automatic Combustion Control Systems for coal, oil, gas or other fuels, Hydraulic or Electric; Automatic Draft Regulators, Hydraulic or Electric; Lever operated regulating Valves; Four-way pilot Valves, Hydraulic Cylinders; Manual four-way Valves; Oil pressure systems, steam or electric; Valve operators, Hydraulic or Electric; Automatic Pressure or suction Regulators.

#### CARRICK TYPE HF-1 HYDRAULIC FURNACE DRAFT REGULATOR

The Carrick Furnace Draft Regulators have been used for 14 years to control the combustion chamber draft in the boiler plant.



Several sizes and designs of draft Regulators are available to meet the requirements of plants ranging in size from large central stations to apartment heating plants.

The Regulators are suitable for use with any kind of fuel, boiler, stoker, gas or oil burners and equally satisfactory service can be secured, generally with a substantial saving in fuel costs.

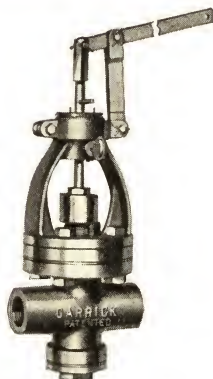
For more complete information on the results secured with this Regulator write for our *Bulletin No. 102*.

#### CARRICK TYPE FT NO. 1 ADJUSTABLE FLO-TROL VALVE

The Carrick Type FT No. 1 Adjustable Flo-trol Valve is of the moving plug type. It is constructed of suitable materials to meet

the requirements of the service for which it is to be used. Generally it constitutes a part of an Automatic Combustion Control System.

The Flo-trol is an automatic, lever operated valve which incorporates manual adjustments for changing the flow of fluids being automatically maintained. Ask for *Bulletin 205*.



## FRED S. CARVER

*Established 1912*

349 HUDSON STREET, NEW YORK

*Mechanical Engineer and Manufacturer  
of Hydraulic Equipment for Special Uses*

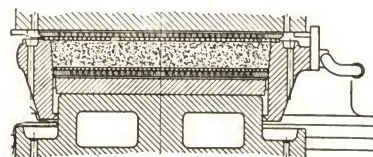
#### Hydraulic Presses for separating liquids and solids.

Presses for Cocoa Butter, Vegetable and other Oils, Cake Forming Presses, etc. Hydraulic Operating and Accumulator Systems for Presses; Hydraulic Valves, Gauges and Fittings; Laboratory Presses. We lay out and furnish complete installations.

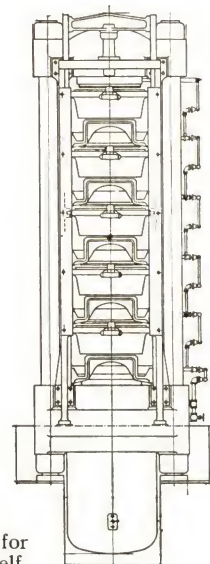
#### CARVER POT TYPE FILTER PRESS:

For separation of liquids from semi-liquid materials under very high pressures. Material is confined in a series of cylindrical pot units. Liquid is pressed out through filter plates, leaving cakes in pots, which are automatically ejected.

We are looking for new uses for these machines and will make laboratory tests of your material.



Showing Pot Closed and Pressed Cake



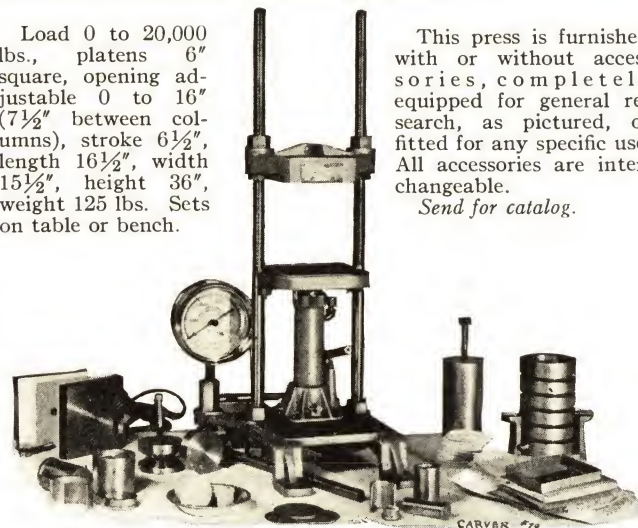
#### THE CARVER LABORATORY PRESS:

This is a small standard Hydraulic Press for Laboratory use—hand-operated, powerful, self-contained. Hundreds are now in use throughout the world, by colleges, government departments and industrial plants for numerous pressing operations.

Load 0 to 20,000 lbs., platens 6" square, opening adjustable 0 to 16" (7½" between columns), stroke 6½", length 16½", width 15½", height 36", weight 125 lbs. Sets on table or bench.

This press is furnished with or without accessories, completely equipped for general research, as pictured, or fitted for any specific use. All accessories are interchangeable.

*Send for catalog.*



#### Some Uses

Plastic Molding, Forming, Blocking—Pressure-Temperature Molding Tests—Flow tests—Extrusion and Extrusion Tests—Laminating—Vulcanizing—Briquetting, Cake Forming—Compression Tests—Crushing Tests—Breaking Tests—Shearing Tests—Gluing and Gluing Tests—Spring Testing—Drawing, Forming, Embossing, Forcing—Pressing Pulp or Fibre Sheets and Boards—Pressing Liquor from Pulp—Dehydrating—Separating Liquids and Solids—Pressure Filtering of thick fluids—Pressing out Vegetable Oils, Stearines and Waxes—Pressing out Animal and Fish Oils, Stearines and Waxes—Splitting of Oils, Stearines and Waxes—Fatty Acid Determinations—Pressing Wax from Mineral Oils—Pressing Oil and Moisture from Wax—Pressing out Plant and Fruit Saps, Juices and Extracts—Pressing out Concentrated Extracts and Flavors—Pressing out Spent Extractions—Pressing Mother Liquors from Crystals—Pressing out Fluids from Animal Tissue—Pressing Bacteria—Pressing out Vaccines and Viruses.

Its application in general research will be evident from this list. Write for catalog giving full details.



# A. W. CASH COMPANY

16TH AND ELDORADO STREETS, DECATUR, ILL.

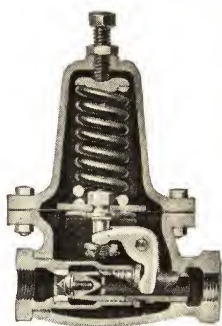
*Pressure Reducing and Regulating Valves and Combustion Control Equipment*

## Products

Automatic Fluid Pressure Control Equipment. VALVES: Reducing, Relief, Pilot, Balanced Lever. GOVERNORS: Pump, Volume Flow. Liquid Level and Vacuum Controllers. Blower and Fan Engine Regulators. Strainers. For Refrigeration use: Expansion Valves, Back Pressure Control Valves, Condenser Water Regulators, Strainers. Complete Systems of Combustion Control; Draft Regulators.

### Pressure Reducing and Regulating Valves

**No. 1000:** Investigate this *new* Valve. Due to its scientific streamline construction this Cash Standard



No. 1000 Pressure Reducing Valve

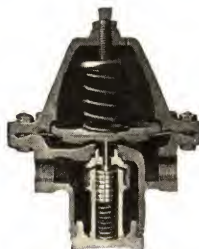
No. 1000 Pressure Reducing Valve is taking the limelight—and will hold it. "The greatest step in advance in many years," says one large user; after six months' experience with 38 of them. The fluid flows through the valve in a straight line—a streamline. No detour around a dividing wall; hence, no turbulence. An aspirating effect pulls down the pressure in the control chamber to get maximum flow under peak demand. All insuring enormous capacity, even on low differential pressures.

Seat and disc entirely removable. High or low pressures; all fluids. All normal trims.

Sizes:  $\frac{1}{2}$  to 2 in. screw ends; expanded outlets. Unique; new; entirely different.

**Class D:** The well known Cash Standard Class D Pressure Reducing Valve; good for steam, water, air, oil, many chemicals and most gases. Very simple in construction; built-in strainer; working unit easy to remove and replace on the job.

Sizes:  $\frac{1}{4}$  to 2 in. screwed;  $1\frac{1}{2}$  and 2 in. flanged ends. Available in all standard trims.



Class D Pressure Reducing Valve



Class G Reducing Valve

**Class G:** The Cash Standard Class G Pressure Reducing and Regulating Valve may be direct operated, as shown at the left, or it may be auxiliary operated. All the inside working parts are removable as a unit, for easy replacement. Sizes: 1 to 3 in. screwed;  $1\frac{1}{2}$  to 10 in. flanged ends. For universal use. All standard trims.

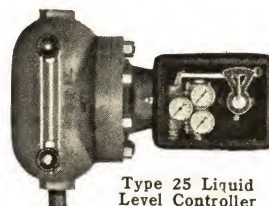


"70" Controller and Valve

**Type 70:** The Cash Standard Type 70 Controller for automatic regulation of all kinds. Works on very slight pressure changes; and provides lots of power to operate even the very largest balanced valves, chronometer valves, butterfly valves, dampers, rheostats, etc. It is shown (right) operating a balanced valve to maintain a constant reduced pressure.

## Liquid Level Controller

**Type 25:** The Compensating Type Cash Standard Type 25 Liquid Level Controller (air pilot circuit) with adjustable range that will give full travel of the Diaphragm Valve on  $\frac{1}{2}$  to 6 in. change in level, as desired. Ball Bearing construction; indicator; reverse action adjustment; weatherproof enclosed mechanism; stainless steel ball float and trim.



Type 25 Liquid Level Controller

## Relief Valves

Cash Standard Relief Valves are made in a wide variety of types—globe type or angle type; single or double seat; spring loaded piston—or diaphragm type, like the Class B-Q Valve (right). Direct operated; or pilot operated; vacuum or pressure; or combined vacuum and pressure. All sizes and trims.

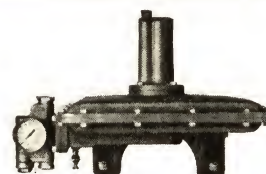


## Complete Systems: Automatic Combustion Control

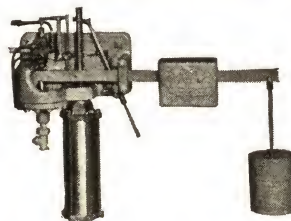
Cash Standard Systems are unexcelled for use on all kinds of boilers, and for all fuels—no matter whether the plant is very small or very large. All the elements entering into efficient combustion are controlled automatically; and the rate of combustion is regulated simultaneously to keep pace with changes in steam demand.

The three Controllers shown below are merely typical of many other units employed in Cash Standard Automatic Control Systems. They are not limited to steam boilers; they are good for many types of furnaces and industrial uses.

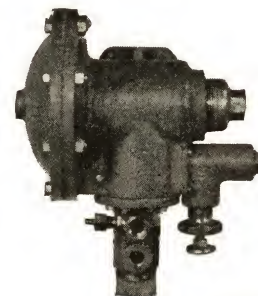
The Cash Standard Type 90 Controller (right) operates a remotely installed hydraulic cylinder, normally regulating forced draft dampers on forced draft jobs; either alone or as part of a system. It is supersensitive; fully automatic; full floating type; has no packing or gasometer. Unique and inexpensive.



The Type 70 Controller (below) with its hydraulic cylinder responds to slight changes in steam pressure; normally regulates fuel feed; but is also used in many other ways. Fully compensated, floating type, will not hunt. Has range adjustment—and power to spare for any size job however large.



The Type 200 Controller (right) another Cash Standard pressure controller performs precisely the same functions as the Type 70, but has a remote power cylinder. It is sensitive, dependable, fully compensated, floating type, will not hunt. Has range adjustment. Not powered for extremely large boilers. Inexpensive.





# CHAIN BELT COMPANY

1630 WEST BRUCE STREET, MILWAUKEE, WIS.

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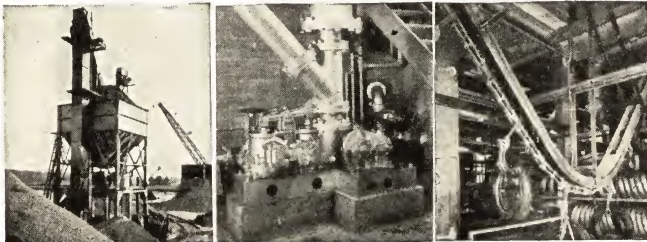
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SYRACUSE, N. Y. . . . . 406 Franklin St.  
WISCONSIN DISTRICT OFFICE, MILWAUKEE, WIS.  
ENG.—LONDON, W. C. 2

## PRODUCTS:

REX CONVEYING SYSTEMS, ELEVATORS and CONVEYORS for handling all types of bulk materials, work in process and package goods; Rex Pivoted Bucket Carriers, Rex-Stearns Belt Conveyors, Rex Coal and Ash Handling Systems, Rex Bulk Handling Systems, Rex Package Handling Systems, Rex Overhead Conveying Systems, Rex Foundry Sand Handling Systems, Rex Progressive Assembly Conveyors, Rex Elevators of all types, Rex Pan Conveyors and Apron Feeders, Rex Scraper Flight Conveyors, Rex Stripping Conveyors, Rex Chains and Transmission Machinery, Rex Roller Chain, Rex Sanitation Equipment and Rex Z-Metal.

### REX TRAVELING WATER SCREENS.

Also, Rex Land-saver Storage Systems, Rex Concrete Mixers and Pavers, Rex Plaster and Mortar Mixers, Rex Pumps, Rex Saw Rigs, Rex Moto-mixers, Rex Cold Patch Mixers and the Rex Pumpcrete (the Pump that Pumps Concrete).



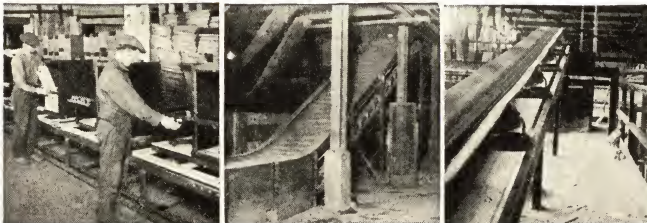
Bucket Elevators

Sludge Pumps

Overhead Conveyors

## THE REX 330 AND 440 CATALOGS AND ENGINEERING DATA BOOKS:

The Rex 330 Catalog covers the subjects of Chain, Conveying and Power Transmission Equipment. It covers all phases—chain, belt conveyors, traveling water screens, foundry equipment, etc. It consists of 816 pages, exhaustively indexed for quick use.



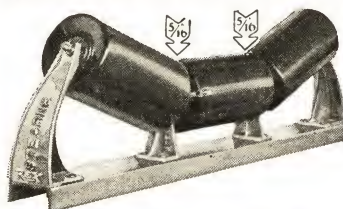
Progressive Assembly

Apron Conveyors

Belt Conveyors

The 440 Catalog, a catalog and engineering data book is devoted to the treatment of Roller Chains and Sprockets, containing prices, weights and information on the application of Rex Roller Chains, Rex Block Chains, Rex Leaf Chains and Rex cut tooth sprockets. Both treatises will be sent free to persons by request, in firms using or specifying material as mentioned above.

## REX-STEARN'S BELT CONVEYOR:



Available in carrier units, standardized conveyor units, and complete belt conveying installations. One-piece pulley shell construction, independently mounted, Timken bearing equipped, long-time lubrication. Made in four types: chilled face cast iron, tubular steel, gray cast iron and rubber covered. Every kind of service found in belt conveying is provided for in this complete line of antifriction idlers. Write for complete information.



(Reg. U. S. Pat. Off.)

## REX SPROCKETS, BUCKETS, SET-COLLARS:

Have teeth and rim hardened to make a tougher and longer wearing surface. For chain from  $\frac{3}{8}$  to 30-in. pitch.



Buckets for all services and set-collars and take-ups.

## REX DRIVE AND CONVEYING CHAINS:

Of all types, steel, malleable and combination, for conveying, power transmission and duplicate machinery services. Also Detachable, Pintle H Type, Ley Bushed and other types.



Rex Griplink with Hidden Shoulders Working Loads 100 to 4500 Lb.

Rex Chabelco All-Steel Roller Chain Working Loads 150 to 10,000 Lb.

Rex Durobar with Relieved Barrel Working Loads 500 to 8400 Lb.

Rex Unicast One-Piece Link Roller Chain Working Loads 150 to 5500 Lb.

## REX TRAVELING WATER SCREEN:

Now in general use for screening out debris and animal matter in advance of filtration and power plant intakes. Built to meet all specifications.

## REX ROLLER CHAIN:



A complete line of roller chain in all standard sizes from  $\frac{3}{8}$  in. to  $2\frac{1}{2}$  in., of a high degree of finish, accuracy and uniformity.

## REX Z-METAL CHAINS:

A new series of Cast Chains, by the Chain Belt Company, is produced of Rex Z-Metal. Rex Z-Metal is harder and stronger than usual or normal cast or forged steels. This remarkable metal is ideal for use in chain, providing great strength-hardness—long wear—and peculiarly great resistance to many kinds of corrosion from acids and other chemicals.

The important advantage of Rex Z-Metal Chain is the opportunity offered to users of cast chains to increase the life of any installation without making expensive changes in the style and size of chains and sprockets already in use.



Rex Traveling Water Screen



# THE CHAPLIN-FULTON MFG. COMPANY

28-40 PENN AVENUE, PITTSBURGH, PA.

*Manufacturers of Steam Specialties*

## PRODUCTS

VIGILANT FEED WATER REGULATOR; FULTON ALTITUDE GOVERNOR; FULTON WATER REDUCING REGULATOR; BINGHAM GAGE COCK; FULTON CONSTANT PRESSURE PUMP GOVERNOR; FULTON BOILER-FEED PUMP GOVERNOR; FULTON STEAM REDUCING VALVE; FULTON PATENT EJECTOR.

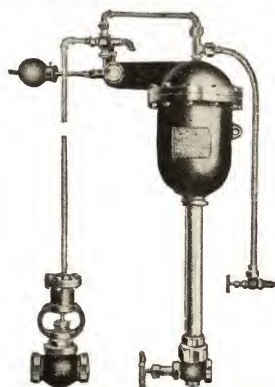
Also manufacturers of Fulton High Pressure or Reducing Regulators, Fulton Low Pressure Regulators, Fulton House Service Regulators, Fulton Duplex Sensitive Gas Governors, Fulton Gas-Fuel Boiler Governors, for steam boilers, using natural or artificial gas for fuel; Fulton Gas Relief Valves, for natural gas gasoline plants; Fulton Back, or Check Pressure Regulators, for natural or artificial gas.

### VIGILANT FEED WATER REGULATOR

The Vigilant operates on the principle of displacement with no complicated system of levers, floats or diaphragms.

Will automatically supply to steam boiler exact amount of water that is being converted into steam, thereby maintaining constant water level.

Adaptable to any size or style of boiler, independent or in batteries.



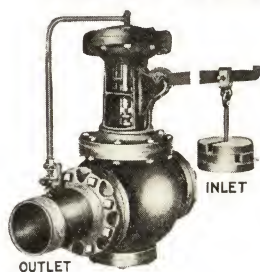
Vigilant Feed Water Regulator

### FULTON WATER REDUCING REGULATOR

Its duty is to reduce a varying inlet water pressure to a constant and predetermined outlet pressure.

Can be furnished with any trim but our standard construction is iron body, bronze trim.

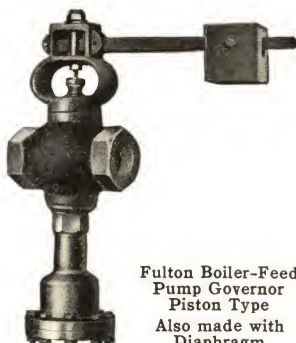
Sizes, 2 inches and up, either hard or soft seats.



Fulton Water Reducing Regulator

### FULTON BOILER-FEED PUMP GOVERNOR

Automatic regulation of pump in accordance with changing boiler requirements is secured by Fulton governor. Fix excess pressure in feed line at 10 lbs., and at 10 lbs. the difference will remain, regardless of how boiler pressure fluctuates. Since boiler pressure is carried on one side of piston and pump pressure on the other, only a small difference in pressure between them has to be balanced by governor weight and lever, a marked contrast to the immense springs, etc., often employed.



Fulton Boiler-Feed Pump Governor  
Piston Type  
Also made with Diaphragm

### FULTON CONSTANT PRESSURE PUMP GOVERNORS

Fulton Constant Pressure Pump Governor, placed in steam line to a pump, maintains a level at any desired height with but little variation in tanks, standpipes, reservoirs, water towers, etc., or maintains a constant pressure in water mains.

May be used in same manner for pumping oil, acid, gas or any liquid it is desired to maintain at a uniform head.

Two types of this governor are illustrated. The lever type is suitable for controlling pressures from 10 to 200 lbs., whereas the spring type is suitable for pressures from 5 to 100 lbs.

Either type may be furnished with V-port or gradual opening valves.

When forcing liquids through heaters, filters, clarifiers or other obstructions, connection to diaphragm must be made beyond them, and into the pipe or tank in which uniform pressure is to be maintained.



Spring Type

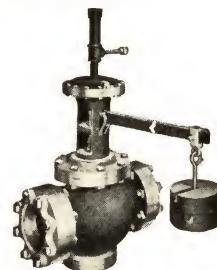


Lever Type

### FULTON STEAM REDUCING VALVE

Valves, 3 inches and larger, have flanged ends with companion flanges bolted on; are also provided with a trap so that live steam does not come in contact with diaphragm.

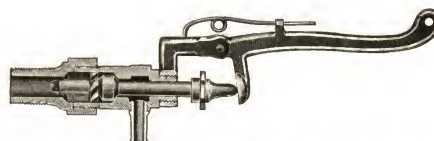
Smaller sizes can be furnished with increased outlet for low pressure heating systems. Lever is balanced on a knife-edged fulcrum and supports valve stem by means of a toggle connection which reduces friction and insures quick response to slightest change of load.



Fulton Steam Reducing Valve

### BINGHAM GAGE COCK

So constructed that, when testing for water, the valve whirls around with sufficient velocity that it grinds the seat clean and true by its own rotation. This obviates any need of replacement or removal for special grinding and assures perfect opening and closing action at all times.



Bingham Patent Self-grinding, Rotating Gage Cock

Furnished with long shank for screwing into boiler heads or short shank for water columns.



# CHICAGO BRIDGE & IRON WORKS

2131 OLD COLONY BLDG., CHICAGO, ILL.

IN CANADA: HORTON STEEL WORKS, LTD., FORT ERIE, ONTARIO

NEW YORK . . . . . 3326-165 Broadway Building  
BOSTON . . . . . 1502 Consolidated Gas Building  
PHILADELPHIA . . . . . 2626—"1616" Walnut St. Building  
CLEVELAND . . . . . 2209 Rockefeller Building  
BIRMINGHAM . . . . . 1504 Fiftieth St., North  
DALLAS . . . . . 1227 Burt Building

TULSA . . . . . 1618 Thompson Building  
HOUSTON . . . . . 2919 Main Street  
DETROIT . . . . . 1502 Lafayette Building  
SAN FRANCISCO . . . . . 1052 Rialto Building  
LOS ANGELES . . . . . 1410 Wm. Fox Building  
HAVANA, CUBA . . . . . Apartado 2507

PLANTS: CHICAGO, BIRMINGHAM, GREENVILLE, PA., and FORT ERIE, ONT. (HORTON STEEL WORKS, LTD.)

## PRODUCTS:

Elevated Tanks, Storage Tanks, Creosoting Cylinders, Digesters, Rotary and Vertical Kilns, Blast Furnaces, Steel Pipe, Smokestacks, Oil Refinery Equipment, Wiggins Roofs, Gas Holders, Hortonspheres, Hortonspheroids, Steel Plate Construction.

## ELEVATED TANKS:

Horton elevated tanks are constructed entirely of steel. Built in standard capacities ranging from 5000 to 2,000,000 gallons (see tables below). Quotations made on the structure complete, erected on foundations placed by others; foundation plans furnished. Installations for automatic sprinkler systems meet insurance requirements. Please state capacity, height to bottom and location when requesting quotations.

ELLIPSOIDAL-BOTTOM ELEVATED TANKS

Nominal Capacity, Gal.	Tank Dimensions			
	D	H	B	K
15,000	15' 6"	8' 9 1/2"	3' 7"	12' 4 1/2"
20,000	15' 6"	12' 3 1/2"	3' 7"	15' 10 1/2"
25,000	18' 0"	10' 9 1/2"	4' 5"	15' 2 1/2"
30,000	18' 0"	13' 3 1/2"	4' 6"	17' 9 1/2"
40,000	20' 0"	13' 9"	5' 0"	18' 9"
50,000	22' 0"	14' 0"	5' 6"	19' 6"
60,000	24' 0"	14' 0"	6' 0"	20' 0"
75,000	26' 0"	15' 0"	6' 6"	21' 6"
100,000	28' 8"	16' 0"	7' 2"	23' 2"
125,000	28' 8"	21' 2"	7' 2"	28' 4"
150,000	34' 0"	16' 6"	8' 6"	25' 0"
200,000	38' 0"	17' 6"	9' 6"	27' 0"
250,000	40' 0"	20' 0"	10' 0"	30' 0"
300,000	41' 0"	23' 9"	10' 3"	34' 0"
400,000	47' 0"	23' 2"	11' 9"	34' 11"
500,000	51' 0"	24' 3"	12' 9"	37' 0"
600,000	54' 0"	26' 3"	13' 6"	39' 9"
750,000	54' 0"	32' 0"	18' 0"	50' 0"
1,000,000	60' 0"	34' 0"	20' 0"	54' 0"
2,000,000	80' 0"	35' 6"	26' 0"	61' 6"

HEMISPHERICAL-BOTTOM ELEVATED TANKS

Nominal Capacity, Gal.	Tank Dimensions			
	D	H	B	K
5,000	8' 11"	7' 8"	3' 8"	11' 4"
10,000	10' 8"	11' 10"	4' 7"	16' 5"
15,000	12' 9"	11' 9"	5' 11"	17' 8"
20,000	12' 9"	17' 3"	4' 10"	22' 1"
25,000	14' 1"	17' 3"	5' 6"	22' 9"
30,000	15' 3"	17' 3"	6' 1"	23' 4"
40,000	17' 4"	17' 3"	7' 2"	24' 5"
50,000	19' 0"	17' 6"	8' 0"	25' 6"
60,000	19' 0"	22' 3"	8' 0"	30' 3"
75,000	22' 0"	19' 4"	9' 6"	28' 10"
100,000	22' 0"	28' 0"	9' 6"	37' 6"
125,000	24' 0"	29' 0"	10' 6"	39' 6"
150,000	26' 0"	29' 3"	11' 6"	40' 9"
200,000	28' 0"	34' 6"	12' 6"	47' 0"
250,000	30' 0"	37' 2"	13' 6"	50' 8"
300,000	32' 0"	40' 0"	14' 0"	54' 6"
400,000	35' 0"	44' 0"	16' 0"	60' 0"
500,000	38' 0"	46' 6"	17' 6"	64' 0"

Height to bottom—any even foot, except for capacities of 30,000 gals. or less, which are furnished in standard story heights. We will quote on nearest standard height to actual requirements.

## STORAGE TANKS:

Horton flat-bottom tanks are built in the standard sizes from 25,000 gal. up, for the storage of all kinds of liquids. Those for heavy liquids such as heavy acids,



Flat-Bottom Storage Tanks

molasses, etc., are designed particularly for the weight of the liquid they are to store.

When fixed roofs are used low pitch cone types recommended for all sizes. Umbrella roofs, however, may be had on tanks under 41 ft. dia. if desired. Storage tanks for oil are often equipped with Wiggins Floating Roofs or Wiggins Breather Roofs to prevent evaporation and fire.

Quotations are made on tanks erected complete with our own experienced crews. Grades or foundations ordinarily put in by the customer. When asking quotations, state capacity, location and whether or not special dimensions are required.

## STEEL PLATE WORK:

We will appreciate the opportunity of submitting quotations on all types of steel plate work such as bins, gas holders, kilns, steel pipe, etc. Send blueprints and specifications of your designs or we will figure on our design to meet your requirements.



Storage Bin

## SMOKESTACKS:

Self-supporting smokestacks and breechings erected at any location and guyed stacks fabricated at Birmingham and Fort Erie, Ont., plants. State diameter, height and number and size of openings when asking quotations.

## PRESSURE TANKS:

We build Hortonspheres in standard sizes up to 60 ft. dia., for storage of gases or liquids under pressure. Also vertical or horizontal bullets and cylindrical tanks for butane, propane, etc. Butt welded construction used unless otherwise specified.

## STEEL PIPE:

We are equipped to build large diameter steel pipe complete with Tees, Wyes and any other connections required. Sizes from 4 to 10 ft. diameter fabricated in shop on automatic equipment and shipped in sections. Larger sizes erected complete in field. Write for estimating prices.



# CHICAGO TUBING & BRAIDING COMPANY

MAYWOOD, ILLINOIS

(Chicago Suburb)

## SALES OFFICES

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CLEVELAND, OHIO . . . 1122 Fidelity Bldg., 1940 E. 6th Street  
DETROIT, MICH. . . . . 1428 West Lafayette Blvd.  
PITTSBURGH, PA. . . . . 1711 Investment Bldg., Fourth Ave.

HOUSTON, TEXAS, W. H. Steigerwald Co., Inc., 2119 Dallas Ave.  
NEW ORLEANS, LA. . . Sidney Farrar, 5607 Prytania Street  
ST. PAUL, MINN., G. A. Ashton Co., Inc., 1547 University Ave.  
SAN FRANCISCO, CAL. . . . . R. W. Gould, Inc., Box 344

"Rex-Tube" Flexible Metal Hose and Tubing, made from Galvanized Steel, Bronze, Brass, Aluminum, Stainless Steel, Monel Metal.

Sizes  $\frac{1}{8}$ " to 14", inclusive.



"Rex-Weld" Corrugated Flexible Steel Tubing.

"Rex-Weld" Corrugated Flexible Bronze Tubing.

"Rex" Corrugated Seamless Flexible Bronze Tubing.

Sizes  $\frac{5}{32}$ " to 2", inclusive.



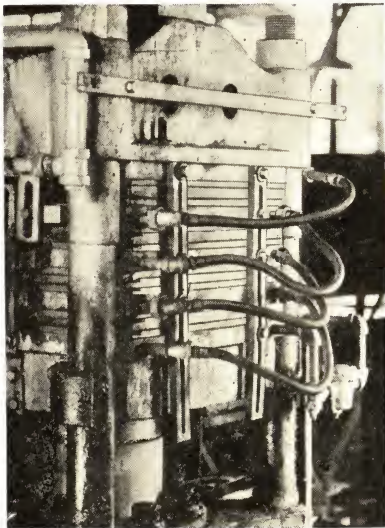
**RT15 Flexible Hose**, galvanized steel or bronze, made to U. S. Navy Specifications, is used for conducting fluids and vapors under the most difficult circumstances. Its sturdy construction assures long life and low unit cost.



**RT20 Flexible Hose**, galvanized steel or bronze, is type RT15 with the addition of one or more metal braids. The metal braids greatly increase its strength and prevent injurious deformations.

**Couplings for RT15 and RT20 Flexible Hose** are available in both the soldered-on and packed-on types, with male and female threads.

*Write for Bulletin No. 52.*

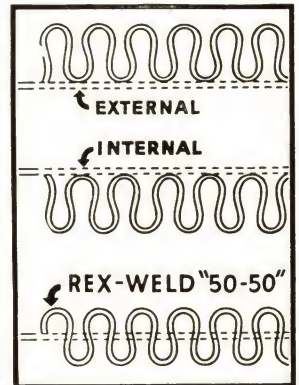


Photograph above shows RT20 Flexible Bronze Steam Hose units operating on Multiple Platen Press in a rubber mill. Such units afford remarkably low operating costs.

**"Rex-Weld" Circularly Corrugated Flexible Bronze and Steel Tubing** are products made possible by remarkable developments in the field of welding. Machines and patent rights for its manufacture in this country are owned exclusively by the Chicago Tubing & Braiding Company.

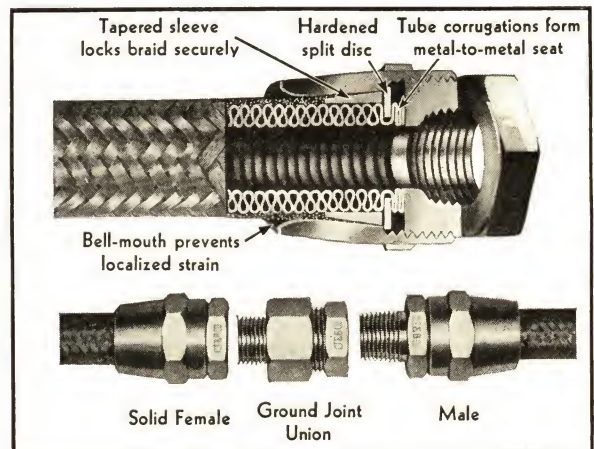
"Rex-Weld" Flexible Steel Tubing, rust-proofed and reasonably priced, easily answers many mechanical problems heretofore most difficult.

**REX-WELD'S "50-50"** principle of construction provides a working from the original "mean" tube diameter of about ONE-HALF that required by other methods. Assuming a corrugation to be one-half inch in depth, REX-WELD'S deviation from the mean or original tube diameter is but one-quarter inch, as compared with a full half inch for the other two types of construction. Obviously, less working of the tube wall means much greater strength.



**"Rex-Tite" metal-to-metal seat couplings**, illustrated below, are available in I.P.T. male thread and I.P.T. solid female threads; also in swivel female threads by use of ground joint unions. Simple to attach. Readily renewable. "Rex-Tite" couplings on REX-WELD tubing gives an all-metal job, without packing, washers or solder. Impervious to the most searching fluids. Welded or soldered couplings also available if desired.

*Write for Bulletin No. RW1.*





## CHICAGO PUMP COMPANY

2334 WOLFRAM ST., CHICAGO, ILL.

Tel. Brunswick 4110

We manufacture the following complete line of Centrifugal Pumps and Pumping Equipment:

Screw-Feed Centrifugal Pumps for dense industrial liquids and liquids with solids in them.

Non-Clogging Pumps

Sewage Ejectors

Bilge or Sump Pumps

Electric Cellar Drainers

Horizontal Centrifugal Pumps

Hot or Cold Water and Brine Circulating Pumps

Vacuum Heating Pumps

Condensation Pumps

Pneumatic Water Systems

Automatic Alternators for duplex pumps to transfer the operation automatically from one pump to the other

Aerators

Liquid Samplers

Comminutor or Chopper Screens

Speed Screens

Water Seal Pumps

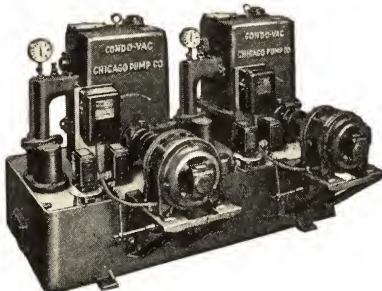


Fig. 2102 (Left)

Duplex "Condo-Vac" Vacuum Heating Pump with Duplex Double Automatic Control.

Fig. 1881 (Right)

Type D Single Stage Double Suction Horizontally Split Case Centrifugal Pump. Direct connected by Flexible Coupling to Electric Motor. Capacities range from 25 G.P.M. up, against any head.

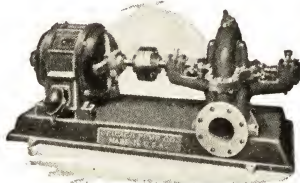


Fig. 1929 (Left)

Type N Close-Coupled Pump and Motor. Capacities range from 3 to 450 G.P.M. against heads between 5 and 200 ft.

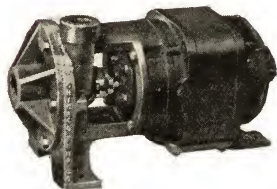
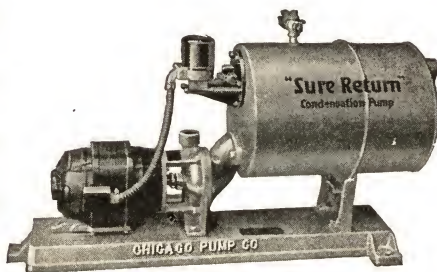


Fig. 1946 (Right)

"Sure Return" Condensation and Boiler-Feed Pump.



## CHISHOLM-MOORE HOIST CORP.

Division of COLUMBUS-MCKINNON CHAIN CORP.

5045 FREMONT AVE., TONAWANDA, N. Y.

BRANCHES: NEW YORK—CHICAGO—CLEVELAND—PHILADELPHIA

Manufacturers of Overhead Hoisting Equipment

### HAND POWER CHAIN HOISTS

"CYCLONE" High Speed, 12 Anti-friction Bearings, 90% Efficiency.

"AL-LITE" Aluminum Alloy. One-third lighter in weight.

"HERCULES" Safety Hoist with Safety Overload Governor.

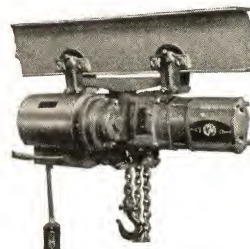
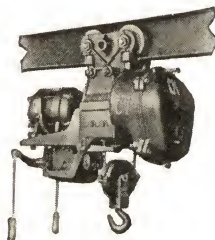


"BLUE BOY" Differential Hoist.

"STANDARD" Screw Geared Hoist.

"CYCLONE" Army Type Ball Bearing Trolley Hoist.

Nos. 406 and 442 Trolley Hoists for extremely low headroom.



### ELECTRIC HOISTS

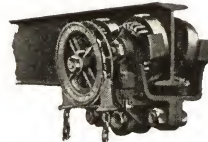
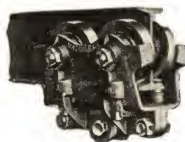
"CYCLONE" Ball Bearing Chain Hoist.

"HI-UP" Low Headroom Rope Hoist.

"C-M" Electric Rope Hoist.

With or without Trolleys. Floor or Cab Control.

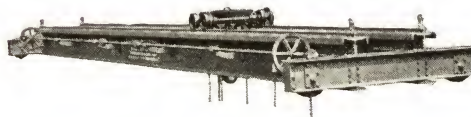
Single or Variable Speeds.  $\frac{1}{4}$  ton to 10 tons' capacity.



### I-BEAM TROLLEYS

"MATCHLESS" Timken Bearing Trolley with Flangeless Track Wheels.

"MOORE" Ball Bearing Trolley.



### OVERHEAD TRAVELING CRANES

$\frac{1}{2}$  ton to 40 tons' Capacity. Hand Power or Electric.

Single or Double I-Beam. Also Mast and Wall Jib Cranes.

Write for complete Catalog No. 50-D.

Mechanical Catalog (1934-35)



# THE CLEVELAND WIRE SPRING CO.

CLEVELAND, OHIO

MAIN OFFICE & SPRING PLANT  
1281 East 38th St., CLEVELAND, OHIO

SHEET METAL PLANT  
East 49th St. and Harvard Road, CLEVELAND, OHIO

## BRANCH OFFICES

DETROIT, MICH. . . 515 Garfield Bldg.

KANSAS CITY, MO. . 4103 Campbell St.

## CLEVELAND WIRE SPRINGS:

**Types:** Cleveland Wire Springs are made for every purpose. Sizes range from .015" diameter wire to  $\frac{9}{16}$ " diameter wire. In a modern plant of adequate capacity we manufacture Compression Springs, Extension Springs, Torsion Springs, Flat Springs, and Special Wire Forms of every description.

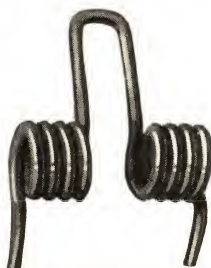
**Materials:** The majority of springs are fabricated from steel. For average requirements, oil tempered carbon spring steel wire will serve satisfactorily. Where the stresses run high and the distortion is rapid, we recommend springs made from alloy steels, hardened and drawn after coiling. For light, delicate work, music wire is utilized. Other metals are used, chiefly in order to resist corrosion, among them being brass, phosphor bronze, and stainless steel. Brass and phosphor bronze have about half the strength of steel, but cost considerably more. Stainless steel is expensive also, but its use in special applications has more than offset the cost.

**Description:** **COMPRESSION SPRINGS:** Are used to resist compressive force and condense in volume as the force is applied. Wire of circular cross-section is ordinarily used, but for special applications, square or flat wire sometimes is required. These springs are wound with a space between the coils.



Compression Spring

**EXTENSION SPRINGS:** Are used to resist an extending force and elongate as the force is applied. Circular wire is used practically to the exclusion of all other special cross-sections. The usual extension spring is wound with the coils touching each other, and consequently is slightly pre-loaded, due to the initial tension. For special requirements the coils are wound with a slight space between.



Torsion Spring



Extension Spring, Conical Ends, Swivel Loops

**TORSION SPRINGS:** Are used to resist a turning force. The lateral force tends to turn one end about a longitudinal axis while the other end is held stationary. Wound with coils touching or not touching depending on design, and are usually made from round wire.

**FLAT SPRINGS:** Used ordinarily in resisting bending forces, and derive their name from their fabrication from flat spring steel. Since the applications are special, the manufacture of flat springs necessitates special tools and consequently an additional charge for same.

**How to Order:** Send blue-prints or samples with as complete information as is possible regarding the work required of the spring. Cover the following specifications:

- A—Size of wire
- B—Outside or inside diameter of spring
- C—Number of coils
- D—Right or left hand coiling
- E—Over-all length when free
- F—Loading
  - (1) Length at desired load (Compression and Extension Springs)
  - (2) Angle of twist at desired load (Torsion Springs)
- G—Finish of ends
  - (1) Compression Springs
    - (a) Plain ends
    - (b) Ground ends
    - (c) Closed and squared ends
    - (d) Closed, squared and ground ends
  - (2) Extension Springs
    - (a) Plain ends
    - (b) Regular loop
    - (c) Regular hook
    - (d) Regular hook or loop on side
    - (e) Conical ends
    - (f) Special ends
  - (3) Torsion and Flat Springs
    - (a) Special ends
- H—Finish of spring
- I—Any other pertinent information.

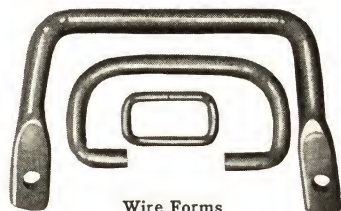


Flat Spring



Extension Spring, Loop and Hook End

## CLEVELAND WIRE FORMS:



Wire Forms

Used wherever a formed wire shape is needed, and the variety of shapes and sizes are limitless. Usually are made from wire of circular cross-section.

## GENERAL INFORMATION:

We carry no stock of springs, since each spring is designed to meet some specific requirement. Prices depend on the quantity ordered, and on the requirements of the spring. Our Engineering Department will be pleased to assist our customers with their spring problems. Our catalogue, which contains some very helpful hints on spring design, will be mailed upon request.



# THE CLEVELAND WORM & GEAR COMPANY

3263 EAST 80TH STREET, CLEVELAND, OHIO

Manufacturers of "Cleveland" Worm Gear Reduction Units

## BRANCH OFFICES

BIRMINGHAM, ALA.  
BOSTON, MASS.  
BUFFALO, N. Y.  
CHARLOTTE, N. C.  
CHICAGO, ILL.

CINCINNATI, OHIO  
CLEVELAND, OHIO  
DALLAS, TEXAS  
DENVER, COL.

DETROIT, MICH.  
GALVESTON, TEXAS  
HOUSTON, TEXAS  
INDIANAPOLIS, IND.

KNOXVILLE, TENN.  
LOS ANGELES, CAL.  
NEW HAVEN, CONN.  
NEW ORLEANS, LA.

NEW YORK, N. Y.  
PHILADELPHIA, PA.  
PITTSBURGH, PA.  
ST. LOUIS, MO.

ST. PAUL, MINN.  
SAN ANTONIO, TEXAS  
SAN FRANCISCO, CAL.  
SEATTLE, WASH.  
SYRACUSE, N. Y.

MONTREAL, QUEBEC

TORONTO, ONT.

VANCOUVER, B. C.

WINNIPEG, MAN.

SYDNEY, NOVA SCOTIA

CANADA: PEACOCK BROTHERS, LTD.

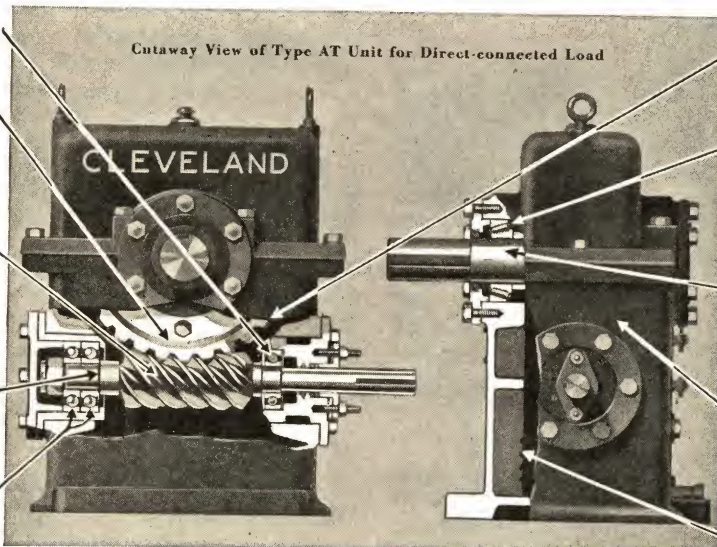
1. Radial bearing floats free in housing.

2. Special analysis bronze gear cast from virgin metals and de-oxidized with phosphorus. Gear rim shrunk and bolted on cast gray iron center.

3. Straight body worm with high pressure angle involute thread. Ground *all over* by process correcting distortion and insuring accurate tooth form.

4. Worm forged integral with shaft of high-grade alloy steel, heat-treated for maximum surface hardness and core strength.

5. Combined radial and thrust bearings carrying thrust load in both directions permitting rotation of worm in either direction.



6. Gear teeth accurately generated with hobs made on special machines in our own plant.

7. Timken heavy duty tapered roller bearings used on each side of gear shaft, carrying both radial and thrust loads. Split bronze journal bearings used on larger sizes.

8. Accurately ground shaft of extra large diameter with standard extension and key way. Standard keys furnished for both shafts.

9. Gray iron housing with heavy wall and flange sections carefully machined. Exterior is rubbed, filled and coated. Interior is smoothed, cleaned and coated with oil and heat resisting compound.

10. Housing walls reinforced with internal ribs.

**Manufacturers of Worm Gear Units Exclusively:** Since its organization 22 years ago, The Cleveland Worm & Gear Company has concentrated solely on the manufacture of worm gear speed reduction units. The Company was the first in this country to manufacture automotive worm gearing in commercial quantities and today operates the only plant devoted exclusively to Worm Gearing.

## Types of Available "Cleveland" Units

**HORIZONTAL DRIVES**  
For direct connected loads  
Type AT (worm below gear)  
Type RT (worm above gear)

**VERTICAL DRIVES**  
Type VT (gear shaft extends upward)  
Type VD (gear shaft extends downward)

**For overhung loads**  
Type AH (worm below gear)  
Type RH (worm above gear)

**For great reductions in speed**  
Type D (double reduction unit)

**Note:** For each size of the above types an average of 25 different ratios is available to meet practically every operating condition.

**Power Capacities:** Transmission capacities range up to about 200 h.p. depending on the ratio and speed required.

**Speeds:** Speed limitations found in many geared reduction units do not apply to "Cleveland" drives. Types AT and RT can be operated up to 4000 r.p.m., other types to 2000 r.p.m.

**Reduction Ratios:** Ratios up to 100:1 can be secured with a single worm and gear. For greater reductions it is necessary to use Type D (double reduction) unit. Special worms and gears can be supplied to meet extraordinary requirements.

**Efficiency of Worm Gear Method of Power Transmission:** In many applications, the worm type gear is the most economical of all methods of power transmission. Under engineering tests, its efficiency is sometimes higher than 95%. Some important contributing factors are simplicity and compactness, steadiness of performance, and adaptability to a great range of conditions; while resulting benefits include low maintenance costs and long life.

**Especial Advantages of "Cleveland" Worm Gear Reduction Units:** To these general merits, "Clevelands" add the advantages that come from the highest standards of quality. The excellence of Cleveland Worm Gear Reduction Units is recognized throughout the industry, and is directly traceable to the extreme care devoted to their design and manufacture—but without materially increasing their cost to the user.

**Factors Assuring "Cleveland" Quality:** Among the many things which The Cleveland Worm & Gear Company does to make its product more useful to customers, the following are especially important:

1—Accurate patterns and jigs. Worms and worm gears are aligned to  $\frac{1}{1000}$ th of an inch accuracy.

2—New metals: no scrap used in Bronze. Exact steel specifications. Careful testing and inspection.

3—Precision production machinery—including costly and intricate tools built to our own order. Machine operations are held to limits unusual in worm gear production by means of a complete system of gauges, jigs and fixtures.

4—Extreme care in cutting and mounting worm thread and gear teeth, to avoid wear. As a result, the worm follows precisely the same path as did the hob which cut the gear teeth; and hence the parts fit more and more closely the longer the unit is in service. Literally, they wear *in* and not *out*.

Workmanship is skilled and closely supervised.

**Dependable Operation:** As there are more than 27,000 "Cleveland" Drives in service, all ratings are proved by experience. Many "Cleveland" Units run for years without having the housing cover removed. Most owners find periodic inspection unnecessary. Unit rating provides ample safety factor against heavy unexpected shock loads. Nothing short of an accident severe enough to destroy the unit will cause sudden failure.

**"Cleveland" Engineers Will Co-operate Gladly:** Whether for replacement in maintenance service, or for incorporation as original equipment into new machinery, engineering readers will doubtless wish specific data about Cleveland Worm Gear Reduction Units. "Cleveland" Engineers will furnish complete details promptly.

**Please Supply This Information:** (1) Horsepower of driving motor or turbine. (2) Actual horsepower to be transmitted. (3) Worm speed. (4) Gear shaft speed. (5) Time unit will be in continuous operation. (6) Description of driven machine or character of service.

**Complete Data:** Complete information on "Cleveland" drives, with specific details as desired, will be furnished promptly upon request.



## COCHRANE CORPORATION

3142 N. 17TH ST., PHILADELPHIA, PA.

### BRANCH OFFICES

ALBUQUERQUE, N. M.  
ATLANTA, GA.  
BALTIMORE, MD.  
BIRMINGHAM, ALA.  
BOSTON, MASS.  
CHARLOTTE, N. C.  
CHICAGO, ILL.  
CINCINNATI, OHIO  
CLEVELAND, OHIO  
DALLAS, TEXAS  
DENVER, COLO.  
DETROIT, MICH.  
EASTON, PA.  
HARRISBURG, PA.

HOUSTON, TEX.  
INDIANAPOLIS, IND.  
KANSAS CITY, MO.  
KNOXVILLE, TENN.  
LOS ANGELES, CAL.  
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NEW ORLEANS, LA.  
NEW YORK, N. Y.  
PHOENIX, ARIZ.  
PITTSBURGH, PA.  
PORTLAND, ORE.  
RICHMOND, VA.  
ROCHESTER, N. Y.

ST. LOUIS, MO.  
SALT LAKE CITY, UTAH  
SAN FRANCISCO, CAL.  
SCRANTON, PA.  
SEATTLE, WASH.  
SYRACUSE, N. Y.  
CALGARY, ALTA.  
TORONTO, ONT.  
MONTREAL, QUE.  
HALIFAX, N. S.  
VANCOUVER  
WINNIPEG, MAN.  
HAVANA  
PARIS

ENGLAND: Geo. E. Sisterson, 45 Lower Belgrave St., LONDON, S. W. 1

### PRODUCT

#### DEAERATING FEED WATER HEATERS

For preventing oxygen corrosion of economizers, boilers, turbine blades, etc. . . . .

#### DEAERATING HOT WATER GENERATORS

For preventing corrosion of iron, steel or brass piping in hot water service systems. . .

#### JET HEATERS

For heating water in very large quantities. . .

#### CLOSED or SURFACE HEATERS

For bleeder stage heating service and for hot water supply in buildings. . . . .

#### MARINE DEAERATING HEATERS

For preventing oxygen corrosion. Designed for efficient operation on shipboard.

#### HOT PROCESS WATER SOFTENERS

Specially adapted to conditioning boiler feed water. Phosphate feed according to the Hall system used for high pressures. . . . .

#### ZEOLITE WATER SOFTENERS

For industrial plants, small boiler plants and domestic service. . . . .

#### CONTINUOUS BOILER BLOW-DOWN SYSTEMS

To prevent priming by controlling the concentration of solids in the boiler water and to recover heat and steam from the blow-down.

#### PRESSURE FILTERS

Used with water softeners, also for clarifying water used in swimming pools, etc. . . . .

#### STEAM PURIFIERS

For removing all water and sludge from steam to protect superheaters and turbines and to permit boilers to be operated at higher ratings. . . . .

#### STEAM and OIL SEPARATORS

For protection of engines, turbines and pumps from water, and exhaust steam utilizing apparatus from grease and oil. . . . .

#### DRAINERS or TRAPS

For removing condensate from coils, jackets, steam lines, etc. . . . .

#### HIGH PRESSURE DISCHARGERS

For draining large quantities of water from apparatus under high pressure. . . . .

#### BACK PRESSURE and ATMOSPHERIC RELIEF VALVES

For limiting pressure in exhaust systems. . .

#### BOILER BLOW-OFF VALVES

Of the one-piece, all-steel, tandem type for the highest pressures. . . . .

#### PILOT-ACTUATED WATER REGULATING VALVES

For controlling water under high pressure by means of floats. Close tightly. . . . .

#### PIPE-FLOW METERS

For measuring steam, air or water. Mechanical and electrical types. . . . .

#### V-NOTCH METERS

Indicating, recording and integrating. Highly accurate over a wide range of flow. . .

Recommendations will be submitted after careful study of the user's requirements by experienced engineers. Publications sent upon request.

### DESCRIBED IN

*Bulletin 688*

*Publication 1810*

*Bulletin 688*

*Bulletin 688*

*Bulletin 689*

*Bulletins 695 & 697*

*Bulletin 692*

*Bulletin 687*

*Bulletin 684*

*Bulletin 671*

*Bulletin 685*

*Bulletin 694*

*Catalog 1381*

*Bulletins 691 & 693*

*Bulletin 696*

*Bulletins 690 & 698*

*Bulletin 679-A*

## THE COOLING TOWER COMPANY, INC.

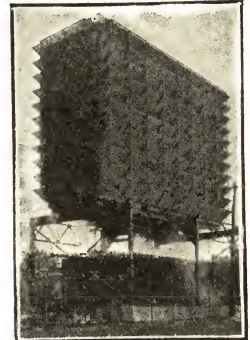
15 JOHN STREET, NEW YORK, N. Y.

*Manufacturers of Cooling Towers, Spray Nozzles and Air Washers*

*Representatives in All Principal Cities*

### ATMOSPHERIC COOLING TOWERS:

The amount of water circulated per square foot of active horizontal area (i.e., the area of one deck) affects the final temperature to which an atmospheric cooling tower will cool. For refrigeration use we recommend using 2 sq. ft. of active horizontal area per ton of refrigeration. For use with internal combustion engines we recommend 1 sq. ft. of active horizontal area for every 10 to 15 hp., depending on the cooling range required. For steam condensing service, it is not quite so easy to determine the size tower required. We must know (1) vacuum required in inches of mercury; (2) condenser differential; (3) amount of steam condensed in pounds per hour. Our *Bulletin 333-M* covers this subject thoroughly. We shall be glad to mail a copy on request.

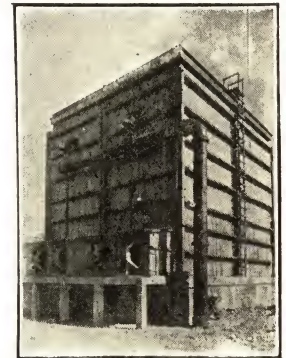


### MECHANICAL DRAFT AND CHIMNEY TYPE TOWERS:

We fabricate, erect and guarantee forced and induced draft cooling towers of any capacity and of any suitable materials, also combined atmospheric and chimney towers, together with straight countercurrent chimney towers.

Our forced draft towers can be equipped with airplane fans, permitting direct connected motors, resulting in a saving in first cost and in power, although these fans are subject to the greater noise of all such high speed equipment.

Our *Bulletin 336-M* describes the above types of towers and contains cooling curves showing results at different loadings.



### SPRAY NOZZLE SYSTEMS:

We make two types of spray nozzles. Our Impact spray nozzle throws a flat, fan-shaped spray cloud. Our Spirodome spray nozzle produces a high conical spray cloud suitable for general installations.

Outstanding features of our spray pond systems are:

- (1) Non-clogging nozzles.
- (2) Freedom from interruption of operation.
- (3) Automatic drain and flush out valve.
- (4) Well designed spray fence for protection against spray drift.

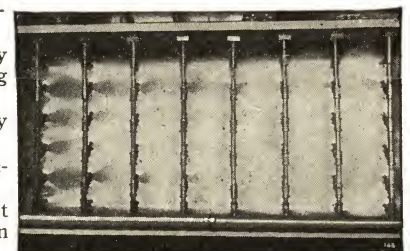
Send for *Bulletin 302-M*.



### IMPACT AIR WASHERS:

Our Impact air washers remove 95% of the dust and leave no free moisture. Their outstanding features are:

- (1) Automatically cleaned without shutting down for washing.
- (2) Lead antimony eliminator plates.
- (3) Heavy construction; no flimsy screens.
- (4) Venturi throat does away with water on floor. *Bulletin 287-M*.



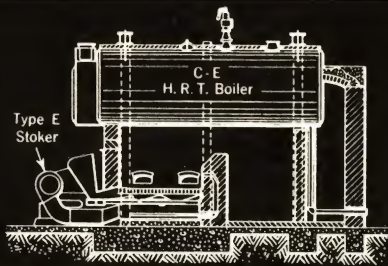


# COMBUSTION ENGINEERING COMPANY, INC.

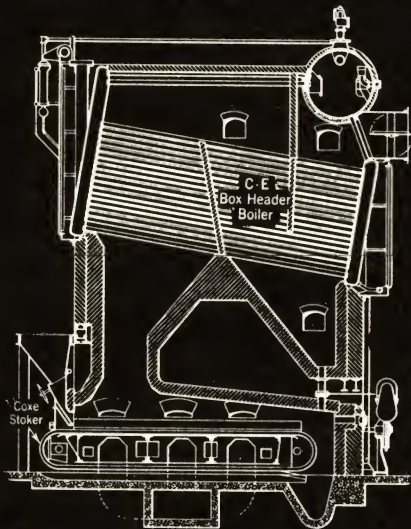
200 MADISON AVE., NEW YORK, N. Y.

Offices in Principal Cities

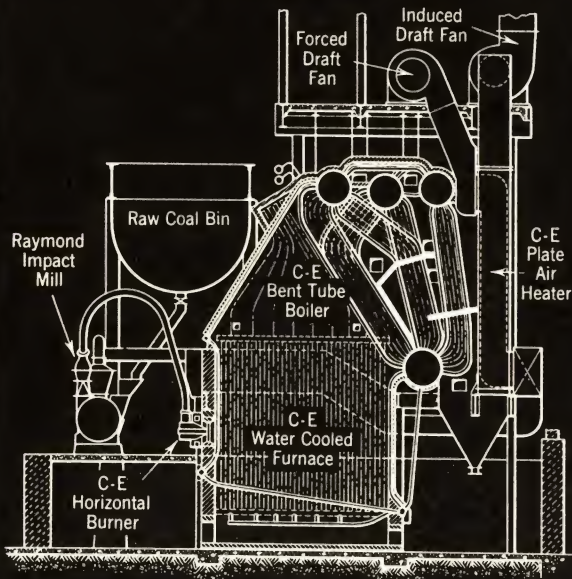
*Manufacturers of all types of pulverized fuel systems, mechanical stokers, boilers, complete steam generating units, water-cooled furnaces, economizers, air heaters, ash handling equipment and welded pressure vessels*



1500 Sq. Ft. Boiler in Chemical Plant. Maximum Equivalent Continuous Capacity 7750 Lb. per Hr. 80 Lb. Drum Operating Pressure



One of Two 5000 Sq. Ft. Boilers in Chemical Plant. Maximum Equivalent Continuous Capacity 25,978 Lb. per Hr. 200 Lb. Drum Operating Pressure



C-E Steam Generating Unit Including 14,420 Sq. Ft. Boiler in Salt Works. Maximum Equivalent Continuous Capacity 181,300 Lb. per Hr. 430 Lb. Drum Operating Pressure

## BOILERS:

**C-E Sectional Header Boiler:** Built in sizes to suit the requirements of commercial practice. The sinuous headers are forged from seamless steel tubes. The ends of the headers are closed by a patented construction which insures strength and tightness. The handholes have machined inside faces. Fusion welded drums. Seamless steel tubes.

**C-E Box Header Boiler:** Built in cross drum and longitudinal drum types ranging in size from about 1000 to 15,000 sq. ft. of heating surface and for pressures up to about 300 lb. per sq. in. Especially suitable for limited space conditions and low headroom.

**C-E Bent Tube Boiler (Design VA):** Built in sizes ranging from about 1500 to 30,000 sq. ft. of heating surface and for any desired pressure. Four fusion welded drums. Seamless steel tubes. The major design feature of this boiler is that alternate sections of tubes in the front bank are connected to the front and middle drums and alternate sections of tubes of the second bank are connected likewise. This results in equal distribution of steam from the most active tubes to two drums. Turbulence in drums is minimized resulting in quieter water level and drier steam.

**C-E Bent Tube Boiler (Design VM):** Three drum design built in sizes ranging from about 1300 to 6300 sq. ft. of heating surface. For limited space conditions and low headroom.

**C-E Multi-Drum Boiler:** Special design for large plants requiring high capacity per boiler unit. Boilers of this type are installed in the Rouge Plant of the Ford Motor Company, the Kips Bay Station of the New York Steam Corporation and the East River Station of the New York Edison Company, the latter having the highest capacity boilers in the world.

**C-E Marine Boilers:** Available in sectional header and bent tube types in a range of sizes adequate for all requirements of the marine field.

**Other C-E Boilers:** Combustion Engineering Company, Inc. also furnishes h.r.t., waste heat and electric boilers.

**Welded Drums:** C-E shop facilities for the fabrication of welded boiler drums are unsurpassed and assure results exceeding the requirements of the A.S.M.E. Boiler Construction Code.

## COMPLETE STEAM GENERATING UNITS:

**Combustion Steam Generator:** A compact unit of standard overall design built in eight sizes providing capacities from 75,000 to 400,000 lb. of steam per hr. at any desired pressure and temperature. Features: a brickless, all water-cooled furnace—corner firing with pulverized coal, oil or gas or any combination of these fuels—controlled superheat temperature—minimum space requirements—excellent overall performance.

**Complete C-E Units:** Comprising any desired combination of boiler, furnace, firing equipment and auxiliaries in a coordinated overall design.

## C-E WATER COOLED FURNACES:

Close or wide tube spacing may be used. Tubes may be cleaned in the same manner as boiler tubes. Exposed surfaces give maximum heat absorption. Insulating materials and casings are supported or suspended independently of tubes. Pulverized fuel furnaces, either dry or slagging type, have bottom tubes. In stoker fired installations, the tubes of lower side walls and bridgewall are protected by C-E Integral Blocks which are fused to the tubes thus avoiding joints having high resistance to heat flow.

## C-E FIN-TUBE ECONOMIZER:

A compact, highly efficient unit in which all return bends are welded and have uniform cross-sectional area. Headers are forged from seamless steel tubing.



## PULVERIZED FUEL EQUIPMENT:

**C-E Storage System:** Particularly adapted to large plants. The mills operate at their most economical rate regardless of boiler load. The reserve supply of pulverized coal in the bins gives ease of firing with variations in boiler output, and insures against loss of boiler capacity due to mill outage.

**C-E Direct Fired System:** Efficient and simple arrangement for many types of industrial furnaces and for boilers ranging from about 1500 sq. ft. of heating surface up to large central station units.

**Raymond Roller Mill:** For either storage or direct fired system. Pneumatic feed control automatically prevents overloading and insures quiet, efficient operation. Equipped with oil lubricated roller journals.

**Raymond Impact Mill:** Used with direct fired system only. Swinging hammers are not subject to damage by matter which may pass through the feeder. Pocket for tramp iron prevents damage to pulverizer. Replaceable manganese steel liners.

**Feeder:** Rotary type, suitable for moist coal.

**Burners:** Various designs of C-E burners are available for firing vertically, horizontally or tangentially. Horizontal types burn coal, oil or gas either alone or in combination.

## STOKERS:

**Type E Single-Retort Underfeed Stoker:** For burning caking or non-caking bituminous coals, or refuse fuels. Applicable to boilers from about 1500 to 6000 sq. ft. of heating surface. Steam or electric drive.

**C-E Stoker Unit:** A single-retort, underfeed stoker for burning bituminous coals. Applicable to boiler sizes from about 400 to 1500 sq. ft. of heating surface. Electrically driven. Stoker gear case, blower and motor compactly arranged.

**C-E Multiple-Retort Underfeed Stoker:** For burning semi-bituminous and bituminous coals. Suitable for boiler sizes from about 4000 sq. ft. up. Stroke of auxiliary rams may be adjusted individually or collectively from stoker front. Design permits accurate control of fuel bed at all times.

**Coxe Traveling Grate Stoker (Forced Draft):** For burning small sizes of anthracite, coke breeze or lignite. Applicable to boilers from about 1500 sq. ft. up.

**Green Chain Grate Stoker (Forced Draft):** For burning non-caking or free burning bituminous coals, lignite or low grade refuse fuels. Applicable to boilers from about 1500 sq. ft. up.

**Green Chain Grate Stoker (Natural Draft):** Designed for burning non-caking or free-burning bituminous coals and lignites; applicable to boilers from 1000 sq. ft. up.

## C-E AIR HEATERS:

Both plate and tubular types are available. The C-E plate heater has a steel casing in which are steel plate envelopes called elements which provide counterflow passages for the gas and air, resulting in maximum heat transfer.

## FABRICATED PRODUCTS:

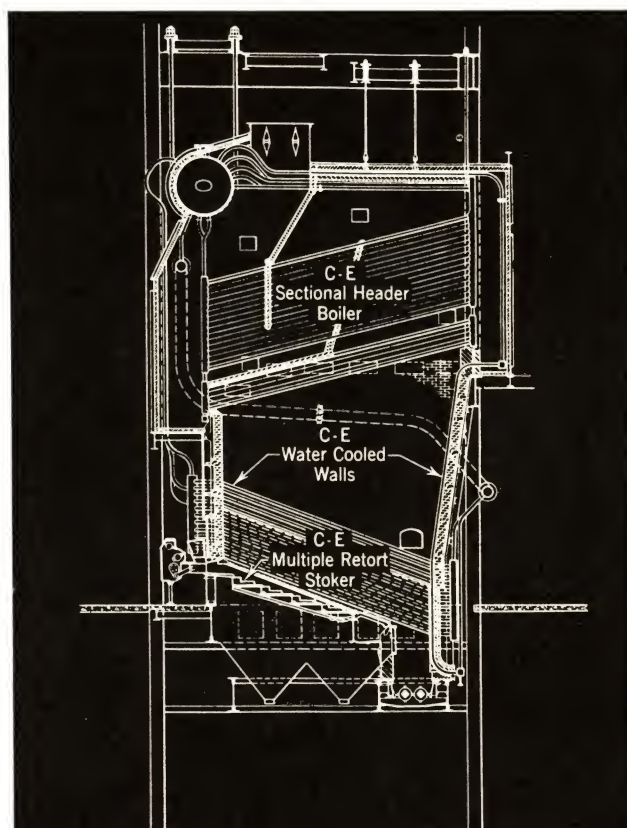
C-E shop facilities are adequate for the fabrication of all kinds of pressure and vacuum vessels, welded or riveted, in carbon steels or alloys; also all classes of tank and plate work.

## MISCELLANEOUS PRODUCTS:

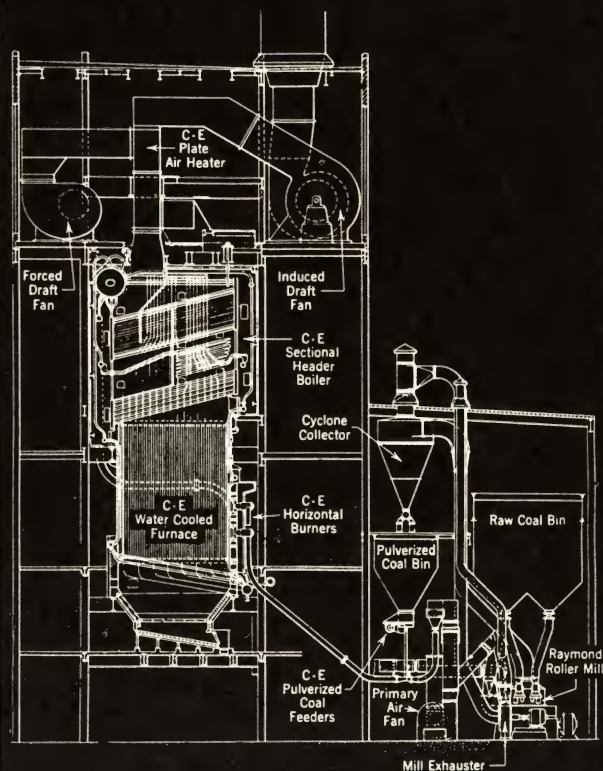
C-E Water-Sealed Ash Conveyors—Green Ash Hoppers—Type H Stokers (for industrial furnaces)—C-E Oil Burners—special furnaces.

## EXPERIENCE:

Combustion Engineering has been a principal contributor to the remarkable advancement that has been made in boiler plant equipment and practice during the past twenty years. The breadth of the Company's experience is reflected not only by these contributions to contemporary progress but by the extent and variety of its work. To date it has equipped nearly 50,000,000 sq. ft. of boiler heating surface with its various types of stokers and pulverized fuel systems—a record unapproached by any other organization in its field. Its many boiler installations include all of the conventional designs (box header, bent tube, sectional header, h.r.t., etc.) and a number of the most notable installations of recent years including the largest high pressure boilers in both utility and industrial fields, the highest pressure boilers in commercial operation in America and the largest boilers in the world.



One of Six C-E Steam Generating Units Including 25,240 Sq. Ft. Boilers in Heating Plant. Maximum Equivalent Continuous Capacity 215,000 Lb. per Hr. 200 Lb. Drum Operating Pressure



C-E Steam Generating Unit Including a 30,300 Sq. Ft. Boiler in Public Utility Plant. Maximum Equivalent Continuous Capacity 540,000 Lb. per Hr. 665 Lb. Drum Operating Pressure



# CONDENSER SERVICE & ENGINEERING CO., INC.

HOME OFFICE AND PLANT  
310 TWELFTH STREET, HOBOKEN, N. J.

NEW YORK, N. Y.

BOSTON, MASS.  
7 Water Street

## BRANCH OFFICES

BALTIMORE, MD.  
5449 Jonquil Avenue

SAVANNAH, GA.  
14 East Bay Street

PHILADELPHIA, PA.

## Affiliated Companies

INSTRUMENT SERVICE CO., INC.  
310 Twelfth Street, HOBOKEN, N. J.

BLACKBURN-SMITH MFG. CO., INC.  
310 Twelfth Street, HOBOKEN, N. J.

MOLTEN METALLIZING CORP'N  
310 Twelfth Street, HOBOKEN, N. J.

## THE COMPANY AND THE SCOPE OF ITS ACTIVITIES

The Condenser Service & Engineering Co., Inc., was organized primarily for the purpose of rendering a prompt and efficient Maintenance Service in the field of surface condenser and heat exchanger application. A staff of engineers with years of experience in every phase of condenser and heat exchanger design, manufacture, maintenance and operation, places the Condenser Service & Engineering Co., Inc., in position to offer invaluable service to users of all classes of heat exchange apparatus. The service of our Engineering Staff is always available to assist in the solution of any Heat Exchange problem.

## SERVICE

### Testing, Cleaning, Retubing, Rebuilding

Surface Condensers	Oil Coolers and Heaters
Feed Water Heaters	Air Compressors—after-coolers
Diesel Engine Inter-coolers	Stills
Oil Refinery Exchangers	Boilers
Heat Exchange Apparatus of all classes	

### Designing, Rebuilding, Modernizing

Special heat transfer equipment designed to meet specific requirements. Old apparatus re-designed and modernized.

### Complete Instrument Service

We repair and rebuild all makes and types of Industrial, Power Plant, Oil Refinery and Marine Instruments.

The Condenser Service & Engineering Co., Inc., specializes in a Maintenance Service that has resulted, in numerous instances, in saving operators 20% and more, of their average annual maintenance costs, notwithstanding the fact that these operators formerly had full maintenance crews of their own.

We are able to effect these economies through (1) the development of effective methods of eliminating the cause of heat exchanger troubles; (2) the exclusive use of specially perfected tools invented by our technicians (the pneumatic tube puller, the broken ferrule removing tool, the special packing tool, etc.) which greatly facilitate service operations, and (3) a capable engineering and working personnel trained exclusively and intensively in heat exchanger work and related activities.

Our operations extend through the Public Utility, Industrial, Refinery and Marine fields. The service is most complete, covering as it does engineering, designing, modernization, manufacturing and maintenance.

Our service is always available

Any Time	24 Hours a Day
Anywhere	7 Days a Week
In Any Emergency	All Year Round

## EQUIPMENT FOR REDUCTION OF CONDENSER MAINTENANCE COSTS

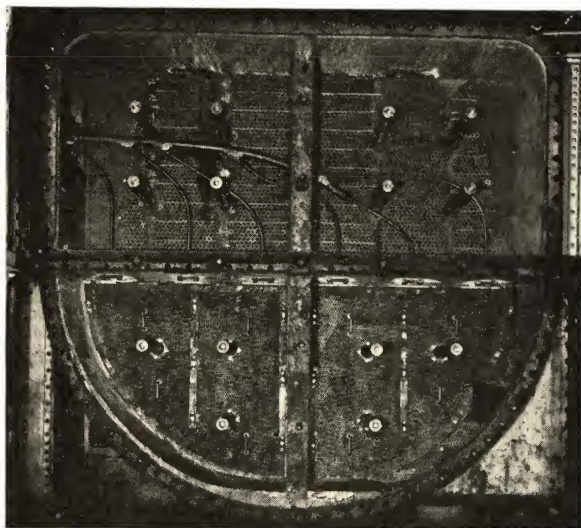
### AIR AND EROSION ELIMINATOR

(PATENTED):

Removes the Cause—Stops the Effect—Prevents Electrolysis—Resists Dezincification—Stops Air Erosion.

This patented device eliminates that destructive element, free oxygen, and, at the same time, stops electrolytic action and dezincification. It is not possible to state, at this time, exactly how much tube life is extended but there is one case where it has been tripled after the tubes were condemned, with no signs of failure to date.

We constantly receive repeat orders from users in widely diversified fields. One of the largest companies of its kind, starting with the installation of a single unit 4 years ago, subsequently installed 27 additional units.



An Air and Erosion Eliminator  
Installed on 40,000 Sq. Ft. Surface Condenser

### HYDRO-DYNAMIC SHOCK TESTING

(PATENTED):

A startling method of tube testing which is saving thousands of dollars in the maintenance of tubular heat exchange equipment. Years of intensive specialization have demonstrated to us that a relatively high percentage of tubes in heat exchangers are prematurely replaced. The decision to retube is usually the result of an increasing number of service interruptions, and in the absence of an accurate method of testing, the operator has no alternative but to order a complete retubing job.

The SHOCK TEST, applied at accurately predetermined pressures to each tube, prevents this waste. Tubes that are about to fail in service are destroyed, and those capable of rendering further satisfactory service are salvaged. As a result, money and time are saved and service interruptions are minimized. References furnished on request.

### "WIZARD" CONDENSER INJECTOR

(PATENTS PENDING):

For stopping condenser leaks without shutdown.

A practical, convenient and almost instantaneous method of stopping condenser tube leakage by injecting a dry sealing mixture into the circulating water. This mixture stops leaks. It is inexpensive and entirely harmless . . . it cannot damage or reduce the efficiency of the condenser in any respect.

The INJECTOR prevents the contamination of boiler feed water . . . reduces boiler maintenance . . . prevents service interruptions. Write for a list of users.





## CONDENSER SERVICE & ENGINEERING CO., INC.

### HEAT EXCHANGER BUNDLES:

We carry on hand at all times all the material needed to furnish complete Heat Exchanger Bundles of all kinds and sizes. Replacement bundles on short notice.

### CONCO GUN AND CLEANING PLUG:

The cleaning plug which makes it possible to obtain that last  $\frac{1}{10}$ " of vacuum—a most effective combination for keeping tubes clean. The Conco Gun and Cleaning Plug will do the job thoroughly . . . quickly . . . economically. In operation the Conco Turbine-type Cleaning Plug is shot through the tube by water at 100 to 200 lbs. per sq. in. pressure . . . without danger of cutting the tube. The blades are arranged to recede toward the center of tube if too solid an obstruction is encountered on tube sidewall. The Conco Gun is specially designed to shoot the Conco Cleaning Plug and is adapted to any size cleaner by simply changing the nozzle.



### FERRULES, PLUGS AND PACKING:

We carry in stock for immediate delivery, in all standard sizes and threads, both the belled-mouth and square-shouldered Ad-

miralty Mixture Slotted Ferrules as well as Plugs. The Slotless Ferrule is also furnished in all sizes, threads and materials. A special wrench is supplied for installing this type.

All sizes fibre metallic and corset lace packing in stock.

### "FLOWRITES" (PATENTED):

"The perfect water inlet nozzle for condenser tubes." Save condenser tube renewals by eliminating erosion at the entrance ends of both new and old tubes. "Flowrites" are short belled-end tubes which are inserted in the water inlet end of condenser tubes and are furnished in sizes to fit all standard sizes and thicknesses of tubes. Comparatively inexpensive and easy to install.



With "Flowrite"

### TUBES:

For condensers and other heat exchangers. We furnish tubes of all sizes and materials used in condensers and other classes of heat exchangers, with the maker's Certificate of Analysis for your protection, and as tangible proof that our tubes meet the most exacting specifications. Whenever you need tubes . . . write, telephone or wire. Your order will be filled, without delay, at best market prices.

### COATING WITH MOLTEN METAL

A highly developed method of spraying molten metal so it will adhere to practically any solid base—on any metal, also Glass, Wood, Plaster, Cement and Brick may be coated with metal. Lead, Tin, Zinc, Aluminum, Copper, Monel, Stainless Steel and High Carbon Steel are a few of the metals that can be applied. The metal, in the form of wire, is fluxed at high temperature and applied at high velocities to become a homogeneous part of work being treated.

#### The Applications of This Service Are Threefold

**RESTORING**, worn parts such as Pistons, Valve Rods, Crank Shafts, Piston Liners, Cylinders, Pump Rods, Valve Rods, Re-

volving or Reciprocating Shafts, Diesel Engine parts are built up with high carbon steel, stainless steel or monel, then ground to original diameter.

**PROTECTING**, such as the coating of structures, tanks and mechanical equipment to prevent weather action, corrosion, chemical action or abrasion.

**DECORATING**, Grille work, both interior and exterior, elevator cages and doors, and similar fixtures or trim, may be coated with bronze or other artistic metals; store fronts, signs, copings, parapets or cornices may be so treated.

### INSTRUMENT SERVICE

We rebuild, repair, overhaul, calibrate, alter scales and ranges on practically all makes and types of Industrial, Marine, Boiler Room and Power House instruments.

This service is unique . . . it is a specialized service developed to the point where it is now serving industrial, Marine, Oil Refinery and Utility fields alike in a way that has never before been attempted.

#### EMERGENCIES:

We work 24 hours a day . . . 7 days a week when required in emergencies. We have repaired gauges and thermometers in two hours.

#### WE REPAIR AND REBUILD:

Recorders—All makes and styles.  
Thermometers—Industrial, Dial, Distant Reading Gauges—Pressure, Vacuum, Draft, Recording and Indicating.  
Balances—Analytical and Dial.  
Clocks—Watchman's, Ships, Time, Cronometers, Stop Watches.

Counters—Revolution, Operation, Yardage, Vibratory Tachometers, Speedometers.

Electrical Meters—Ammeters, Voltmeters, Wattmeters, Pyrometers, Potentiometers.

Barometers	Stack Controls
Thermostats	Control Valves
Hygrometers	Mercury Columns
Mixing Valves	Dial Micrometers
Pneumercators	Engine Indicators

Remote Reading Instruments    Signalling Attachments  
Automatic Temperature Controls

All repair work carries a new instrument guarantee.

We will build special instruments to suit your needs.

New industrial thermometers, all types and sizes, of guaranteed accuracy, manufactured.

### BLACKBURN-SMITH FILTERS, STRAINERS, AND SEWAGE EJECTORS

#### FEED WATER FILTER AND GREASE EXTRACTOR:

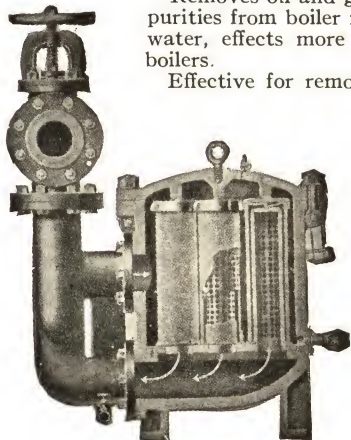
Removes oil and grease from water, removes impurities from boiler make-up water, saves coal and water, effects more efficient heat transmission in boilers.

Effective for removing dirt, clay, sediment and mechanically suspended particles from water supplied for industrial processes, swimming pools and drinking water systems.

Cleaning requires only a few minutes and is accomplished without interrupting service.

Available in single body and twin types in a wide range of capacities.

We furnish filter stockings for all types of filters.



Section of Filter Body

#### MULTI-DUCT STRAINER:

For removing solid mat-

ter from water, oil and other liquids. Used for general supply and power plant purposes. Special wire cloth linings adapt it to special services on dyes, brine, swimming pool water, etc. Can be cleaned without interruption of service. Large straining area results in long operation before cleaning is necessary. Small space required. Can be mounted in any position. Baskets cannot spill contents. Internal parts made of bronze for long wear.

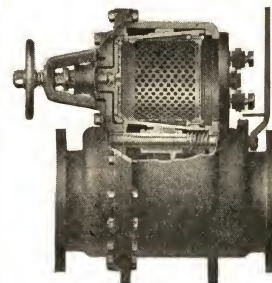
#### PNEUMATIC SEWAGE EJECTOR:

For raising, by compressed air electrically controlled, raw sewage, sludge and liquids bearing solids.

Simple and rugged, insuring, in both design and construction, successful operation without maintenance trouble.

The control of the ejector makes possible the installation of either a reciprocating compressor with air receiving tank, a directly connected rotary compressor or other already available compressed air supply.

Furnished in all capacities and for all lifts.



Strainer Basket in Position for Removal and Cleaning



# CONSOLIDATED ASHCROFT HANCOCK COMPANY

Incorporated

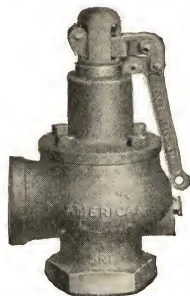
BRIDGEPORT, CONN.

AMERICAN SCHAEFFER & BUDENBERG DIVISION  
CONSOLIDATED SAFETY VALVE DIVISION  
HANCOCK AND METROPOLITAN INJECTOR DIVISION

ASHCROFT AMERICAN GAUGE DIVISION  
HANCOCK VALVE DIVISION

## CONSOLIDATED SAFETY VALVES:

Consolidated Pop Safety Valve for Fire Tube Boilers, iron body, bronze mounted, for pressures up to 250 lb. Type 1414 with screwed outlet as illustrated. Type 1416 with flanged inlet and screwed outlet. This valve is especially designed for Fire Tube Boiler Nozzles standardized in relation to capacity in A.S.M.E. Boiler Code. Made in sizes 2", 2½", 3", 3½", 4" and 4½". Regularly furnished with bronze seat, but is supplied with MMM seat when specified. MMM is a high nickel alloy of exceptional strength and hardness.



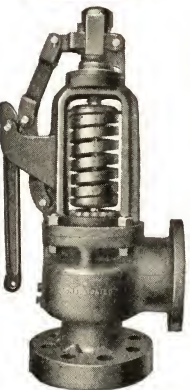
Types 1407 and 1414



Type 1405 and Type 1407 Pop Safety valve, iron body, bronze mounted, for pressures up to 250 lb. with large discharge capacity. Made in 2", 2½", 3", 3½", 4" and 4½" sizes. Regularly furnished with bronze seat, but with MMM seat when specified. Type 1405 has screwed inlet, Type 1407 has flanged inlet.

Type 1411 Pop Safety Valves, as illustrated, for Stationary and Marine Boilers, for saturated steam pressures up to 250 lb., with outside spring, iron body and MMM seat bushing. Made in 1½", 2", 2½", 3", 3½", 4", 4½" and 6" sizes.

Type 1413 Pop Safety Valve similar to Type 1411 except with steel body for saturated or superheated steam pressures to 450 lb. and 750° F. in 1½" to 3" sizes, and to 300 lb. in 3½" to 4½" sizes. Seat bushing and feather are MMM, a high nickel alloy of exceptional strength and hardness. Made in 1½", 2", 2½", 3", 3½", 4", 4½" and 6" sizes.



## CONSOLIDATED SAFETY VALVES (For High Pressures):

Type 1555 High Capacity Cast Steel Safety Valve, with extended reinforced bushing for Water Tube Boilers, exposed spring type, for saturated or superheated steam pressures from 300 lb. to 600 lb. and 800° F.

Type 1556 High Capacity Cast Steel Safety Valve with extended reinforced bushing, for Water Tube Boilers, for saturated or superheated steam pressures from 601 lb. to 900 lb. and total temperatures to 800° F.

Type 1557 High Capacity Cast Steel Safety Valve, with extended reinforced bushing, for Water Tube Boilers, for saturated or superheated steam pressures from 901 lb. to 1500 lb. and 800° F.

Types 1555, 1556, 1557 Type 1558 High Capacity Cast Steel Safety Valve, extended reinforced bushing, for Water Tube Boilers for, saturated or superheated steam pressures from 1501 lb. to 2000 lb. and 800° F.

## PORTABLE POP SAFETY VALVES:

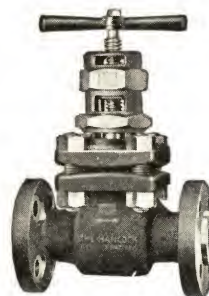


Consolidated American Portable Pop Safety Valves, all bronze, for pressures up to 300 lb. Type 1445 top outlet, made in ½", ¾", 1", 1¼", 1½", 2" and 2½" sizes. Type 1451 side outlet, made in ½", ¾", 1", 1¼", 1½", 2", 2½" and 3" sizes. These valves meet the requirements of A.S.M.E. and various other Boiler Codes. Write for Catalog Z-1.



## HANCOCK FORGED STEEL VALVES:

Hancock Forged Steel Globe Valves for 400 lb., 600 lb., 900 lb. and 1350 lb. standards, in sizes ½", ¾", 1", 1¼", 1½" and 2". Made with renewable MMM seat and disc. MMM is a high nickel alloy of exceptional strength and hardness. There are three types of seats, the flat seat, the bevel seat and the well-known Hancock Cone Seat. Write for Catalog W-1.



## HANCOCK BRONZE VALVES:

Hancock Bronze Valves made to 250 lb. standard for steam pressures up to 300 lb. and water pressures to 500 lb. Every Hancock Valve is tested before shipment at sufficient pressures to guarantee a sound factor of safety and at a minimum of 1000 lb. hydraulic pressure. Made in sizes ⅛", ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2", 2½" and 3". Also supplied with flanged ends instead of screwed ends as shown. Write for Catalog WB-1.



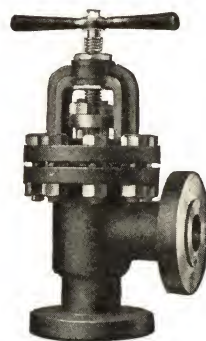
## HANCOCK CHECK VALVES:

Hancock Bronze Globe Check Valves for pressures up to 300 lb., cast steel Check Valves and Swing Check Valves with screwed and flanged ends and caps for pressures up to 650 lb., Forged Steel Check Valves with screwed ends and caps and with flanged ends and flanged bonnets for pressures up to 1350 lb.



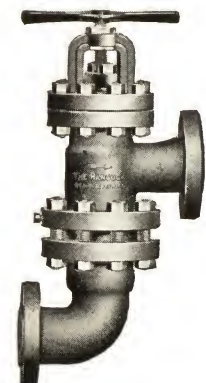
## HANCOCK CAST STEEL VALVES:

Hancock Cast Steel Globe and Angle Valves for 250 lb., 400 lb. and 600 lb. standards, in sizes ¼", ⅜", ½", ¾", 1", 1¼", 1½", 2", 2½", 3", 4", 5", 6". Also Cast Steel Check Valves and Swing Check Valves. 400 lb. Cast Steel Angle Valve with flanged ends shown. Made with renewable MMM Seats. Write for Catalog WA-1.



## HANCOCK STOP AND CHECK VALVES:

Hancock Drumhead Stop and Check Valves, Stop Check Valves and Blow-off Valves. Stop and Check Valves made in bronze and cast steel in 250 lb., 400 lb. and 600 lb. standards. Stop Check Valves of cast steel in 400 lb. and 600 lb. standards. Blow-off Valve of cast steel in 250 lb., 400 lb. and 600 lb. standards. Write for Catalog WC-1.





# CONSOLIDATED ASHCROFT HANCOCK COMPANY

Incorporated

AMERICAN SCHAEFFER & BUDENBERG DIVISION  
CONSOLIDATED SAFETY VALVE DIVISION  
HANCOCK AND METROPOLITAN INJECTOR DIVISION

ASHCROFT AMERICAN GAUGE DIVISION  
HANCOCK VALVE DIVISION

## DURAGAUGES:

The finest pressure gauge made. Accuracy of  $\frac{1}{2}$  of 1%. Made with an indestructible movement of nitralloy steel, with the hardest known surface of any substance except the diamond. This movement is specially designed for use on severe operating services which destroy ordinary gauges in a short time. It operates as smoothly as though it had jewelled bearings. The bourdon tube is bored out of solid, special alloy steel, heat treated for extreme strength, with threaded connections and metal to metal joints at the socket and tip, for all pressures above 100 lbs. The socket is of drop forged steel.

Moisture-proof case of cast iron with cast bronze ring; smooth, dull-black, hard rubber finish; also brass and chromium plated. Three types of cases: for wall mounting; for flush mounting; and for flush mounting with illuminated dial.

All pressures up to 10,000 lb. Write for Catalog T-1.



## ASHCROFT AMERICAN QUALITY GAUGES:

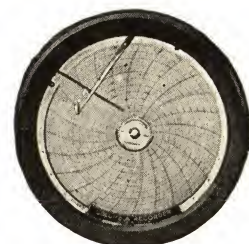
Ashcroft American Quality Gauges are made in all sizes from  $3\frac{1}{2}$  to 12 in., for pressures from 10 to 30,000 lbs. Also for vacuum and compound types for pressure and vacuum.

Write for Catalog A-1.

## AMERICAN RECORDING GAUGES:

American Recording Gauges give a graphic record of pressures and vacuum for all pressures from 6-in. water pressure to 10,000 lb., and for vacuum. Made in a die cast black enameled, moisture-proof case with either bottom or back connection. 10-inch chart with effective scale width of  $3\frac{3}{8}$  in. Instructions lithographed on chart plate, monel metal inverted pen arm. Equipped with a Time Punch which makes every instrument a time clock.

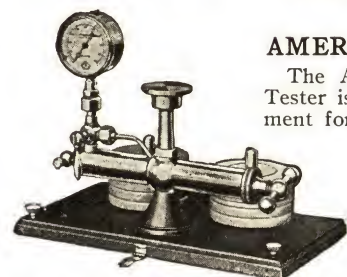
Write for Catalog E-1.



## AMERICAN GAUGE TESTERS:

The American Dead Weight Gauge Tester is a simple and compact instrument for testing gauge pressures up to 1000 lb. Made of brass, nickel plated, on a cast iron base and furnished with die cast weights. All necessary tools are supplied in a carrying case.

Write for Catalog D-1.



## MERCURY COLUMN VACUUM GAUGES:

American Mercury Column Vacuum Gauge, at left, is made in a black enameled steel case with a plate glass front, mounted complete with a catch-all on an oak panel. The scale is silvered finish.

Write for Catalog B-1.

## AMERICAN ABSOLUTE PRESSURE GAUGES:

American Absolute Pressure Gauge, at right, for measuring the accurate absolute pressure in an apparatus under vacuum. Varying barometric pressures do not affect its reading.

Write for Catalog B-1.



## AMERICAN RECORDING THERMOMETERS:

American Recording Thermometers record all temperatures from minus 40° to 1000° F. or equivalent C.

Made in a die cast black enameled, moisture-proof case with 10-in. chart. Standard connecting tubing is 10 ft. and may be furnished up to 200 ft. All American Recorders are furnished with the Time Punch, making every instrument a time clock. Write for Catalog H-1.



## AMERICAN DIAL THERMOMETERS:

American Dial Thermometers in black die cast case and ring, with 6 and 12-in. dial, for all temperatures from minus 40° to 1000° F. and equivalent C. For indicating temperatures some distance away from the point of application. Standard length connecting tubing is 10 ft. and may be furnished up to 200 ft. As easy to read as a gauge. Accuracy guaranteed. A very convenient and rugged thermometer for every industrial purpose.

Can be shipped direct from stock in standard ranges. Write for Catalog G-1.



## AMERICAN THERMOMETERS:

American Glass Indicating Thermometers are made in all sizes and types for every industrial purpose for indicating temperatures from minus 40° to plus 950° F., or equivalent C., in standard graduations. Scale size 7, 9 and 12 in. Hand calibrated scale. Monel bulb chamber. Write for Catalog F-1.



## AMERICAN PRECISION TEMPERATURE CONTROLLERS:

American Precision Temperature Controllers are self operated and simple in construction. For regulating temperatures from 0° to 470° F. and equivalent C.

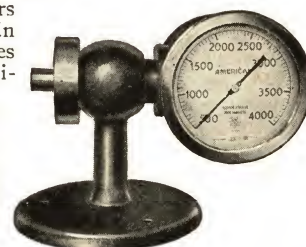
Under favorable conditions temperature will be held within 1°. Sensitive, rugged and accurate. For hot water service tanks, water heaters, etc. Standard ranges carried in stock. Size of valve must be specified. Valve sizes are  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$ , 3,  $3\frac{1}{2}$  and 4 in. Also made reverse acting for controlling cooling processes. Write for Catalog R-1.



## AMERICAN INDICATING TACHOMETERS:

American Indicating Tachometers for indicating speeds directly in revolutions per minute. Dial sizes are 6,  $8\frac{1}{2}$  and 10 in. Used principally for belt drive from pulleys.

Also hand tachometers, as well as recording and combination indicating and recording types. May be calibrated to read in feet per minute or any unit of speed measurement. Write for Catalog J-1.





# COPPUS ENGINEERING CORPORATION

349 PARK AVENUE, WORCESTER, MASS.

*Manufacturers of Blowers, Steam Turbines and Air Filters*

Branches or Representatives in All Principal Cities of the World

## STEAM TURBINES:

Ideal prime movers for pumps, blowers, mixers and many other process machines requiring dependable, compact, economical drive. Scientifically designed according to accepted principles of turbine practice.

Turbine wheels are of two-row velocity stage impulse type with reversing sector. Buckets are of non-erosive, non-corrosive drawn chrome steel alloy. Steam nozzles are accurately finished and controlled by individual valves. Oversize self-aligning ball bearings used. Exceptionally large oil reservoirs insure adequate lubrication. Can be equipped with reliable low-speed, fully enclosed governor, designed especially for these turbines. Unique safety trips also available.

Coppus Steam Turbines can be furnished with built-in speed reducers as either single reduction or double reduction units. All gears are of the herringbone type, which eliminates end thrust and is best suited wherever high primary speeds are used. The high speed pinion is mounted on the turbine shaft extension, the low speed gear on a separate shaft running in liberally oversized ball bearings. Splash lubrication insures ample oil for gears and bearings. For the 9" and 12" Steam Turbines, the available ratios range from 2:1 up to 14:1 and

for the 16" and 20" Steam Turbines from 2:1 up to 17:1. The units are built for both directions of rotation, are sturdy and self-contained and require minimum floor space.

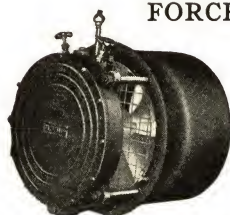
Combine good steam economy with outstanding reliability of operation. Price comparable to that of electric motor of same rating. Built in horizontal and vertical types, in four frame sizes from 1 to 60 HP. Also available in fractional horsepower for special applications at low cost.

Exhaust steam is free from oil and can be used for heating or process work.

Turbines also built for air or gas drive.

Ask for *Bulletin 135-6*.

## FORCED DRAFT BLOWERS:



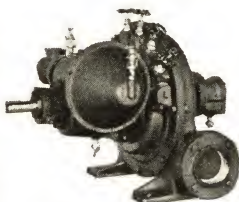
Types "C" and "CM", respectively, steam turbine and electric motor driven, in capacities up to 20,000 c.f.m. for stoker or hand fired boilers. Fan wheels designed for specific static pressures up to 5". Turbines are of one or two row velocity stage impulse type.

Provide increased boiler capacity, maintain even steam pressure independent of natural draft and permit burning low priced fuels and mill wastes.

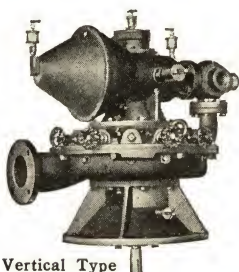
Send for *Bulletins 145 and 148*.

## HEAT KILLERS:

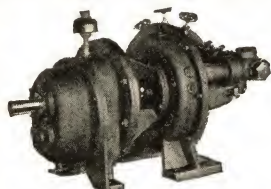
Are man-cooling fans and blowers of either Vano or Aeroplane type, light weight and portable for cooling and ventilating boilers, tanks, furnaces, and in steel mills, foundries, gas plants and all industries where men are exposed to intense heat. Vano types are swivel mounted on tripod and deliver from 950 to 3000 c.f.m. at high velocity. Aeroplane types deliver 10,500 to 15,600 c.f.m. at low velocity. Both types prevent recirculation and deliver a large volume of secondary air.



Horizontal Type



Vertical Type



Steam Turbine with Built-in Speed Reducer Double Reduction Unit

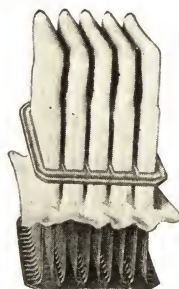


Aeroplane Type

## AIR FILTERS:

Annis Air Filters are used for general ventilation, air conditioning, drying operations, and in ventilating electrical machinery; also on air intakes of compressors or internal combustion engines.

Annis Air Filters are practically 100 per cent efficient (99.9 per cent plus by test) and can be underrated (used for lower capacities) any amount without sacrificing the cleaning efficiency.

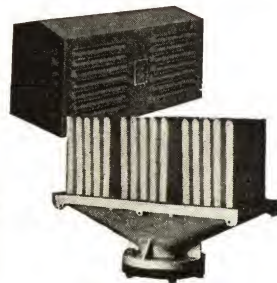


Filter Element Partly on Spacer Frame, with Spreader Grid

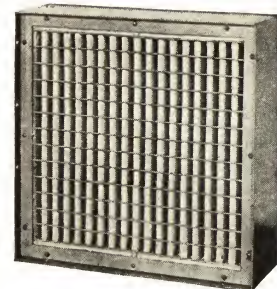
Filters are dry type of simple strong unit construction. The wool felt filter element "Slips on like a glove" over welded wire spacer frame. A spreader grid which, placed over the filter "glove" and wire frame, is bolted to the base, thus drawing the filter "glove" tautly over the supporting frame and sealing the filter tightly against leakage of dirty air.

The filter medium of the Annis Air Filter is "permanent," and does not have to be discarded or removed when it requires cleaning. The cleaning is accomplished with a small portable vacuum cleaner or air lance, thus assuring low cost of upkeep.

Made for any capacity in stationary, also fully automatic types. Send for *Bulletins F-310 and F-320*.



Compressor Filter



Stationary Type Unit Filter

## CABLE MANHOLE VENTILATORS:

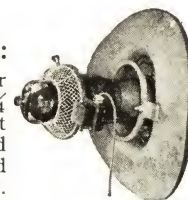


For ventilating cable vaults, tunnels, pipe galleries, coal pockets, shipholds, etc. May be fitted with canvas air pipe. Light weight and easily portable, tripod mounted unit uses Vano type Blower. Furnished with universal electric motor for operation from lighting system or truck storage battery; also gasoline engine driven. Capacities 950 to 1500 c.f.m.

*Bulletins 163 and 166*.

## MANHOLE BLOWER EXHAUSTER:

Vano types, Nos. 150 and 175 are built for ready attachment to manhole and carry  $\frac{1}{4}$  H.P. and  $\frac{1}{2}$  H.P. universal motors, for direct and alternating current. Weigh only 68 and 88 lbs.; can be hooked up easily and locked in place by one person. Complete unit includes man-head and yoke, starting switch, cord and plug.



## CENTRIFUGAL TURBO BLOWERS:

Type M, steam turbine driven, of single unit design, as all Coppus specialties, serves for static pressures up to about 15" with a capacity range of from 400 to 10,000 c.f.m. Used for gas producers and other applications where exhaust steam can be used to good advantage and flexible operation is desired.

Send for *Bulletin 155*.





# CRAMP BRASS AND IRON FOUNDRIES COMPANY

PASCHALL STATION, PHILADELPHIA, PA.

*Engineers and Metallurgists*

SALES OFFICES

NEW YORK

CLEVELAND

DETROIT

PITTSBURGH

SAN FRANCISCO

## PRODUCTS

### CASTINGS—FORGINGS—INGOTS

For high mechanical strength—Corrosion and heat resistance.



## NON-FERROUS ALLOYS

Specialists in non-ferrous alloys for special purposes. Included in this group are the following:

Superstrength Bronze\*

Aluminum Bronze

P. M. G. Metal Alloys

Manganese Bronze

Nickel Bronze

Phosphor Bronze

\* This alloy has an ultimate tensile strength of 115,000 lbs. per square inch—Yield Point 65,000 lbs. per square inch—Elongation 15% in two inches.

In the majority of instances these metals are reduced in electric furnaces assuring the highest quality castings.

## FERROUS ALLOYS

ELECTRIC furnace melting is employed for all special Iron Alloys. In this group are:

Elfur Iron

Nickel Iron

Molybdenum Iron

Chromium Iron

Ni-Resist Iron

These alloys are specified principally where great strength, heat resistance and better wearing qualities are required. Nickel and Chromium Irons may be obtained with tensile strength over 50,000 lbs. per square inch. The Copper Chromium alloys are recommended for their acid and heat resistance.

*Catalogues on request.*

## BEARING METAL PARSONS' WHITE BRASS S.A.

TRADE-MARK REG.

Manufactured for over 30 years of the highest quality virgin metals, it surpasses all in durability.

It is applicable to all classes of bearings from those of marine engines to automobiles and aeroplane motors. It can be used wherever any other babbitt has been used and its lasting qualities cannot be assailed. It is especially suitable for crank-shaft and crank-pin bearings of steam, Diesel and gasoline engines. Steam turbines, generators, saw mill, paper and pulp machinery, stone crushers, cars, water turbines and reduction gear bearings, lined with Parsons' White Brass S.A. never experience trouble from the bearing lining.

### Compressive Tests

Name of Bearing Metal	Deformation of 1" Cube at 70° F.	
	Load 5000 Lbs.	Load 10,000 Lbs.
Parsons' White Brass S.A.	.0000"	.0018"
Government or Genuine	.0006"	.0070"
High Grade Lead Base	.0010"	.0077"

### Hardness Comparison of Babbitts by Brinell Hardness

Name	Brinell Hardness
Parsons' White Brass S.A.	32-38
High Grade Lead Base Babbitt	25-27
Genuine or Government Babbitt	27-30

Above tests were made on a standard Brinell hardness testing machine using a 10 mm. ball and a 500 kg. load, applied for thirty seconds. The variation in hardness number is due to the section thickness of the babbitt in the bearing shell.

## Tensile and Compressive Strength

In machines where the bearings are subjected to heavy pounding action or where thin linings are used in the bearing shell, the babbitt metal must have high tensile strength to resist rupture. High compressive strength is imperative since the ability to carry a heavy load will depend upon the compressive strength and hardness.



# CRANE CO.

GENERAL OFFICES: 836 SOUTH MICHIGAN AVENUE, CHICAGO

NATIONAL EXHIBIT ROOMS: CHICAGO, NEW YORK, ATLANTIC CITY, SAN FRANCISCO and MONTREAL

WORKS: CHICAGO, BRIDGEPORT, BIRMINGHAM, CHATTANOOGA, TRENTON, MONTREAL and St. JOHNS, QUE.

Branches and Sales Offices in 160 Cities

Crane valves are made of brass, iron, ferrosteel, cast carbon and alloy steel, and forged steel for all pressures and purposes.

Crane fittings of malleable iron, ferrosteel, cast iron, forged steel, cast carbon and alloy steel, and brass are supplied in screwed and flanged patterns for every piping requirement.

Crane cast carbon and alloy steel and forged steel valves and fittings are built in accordance with the American Steel Flange Standards for all pressures.

Crane steam specialties include steam traps, steam and oil separators, automatic stop-check valves, emergency stop valves, exhaust relief and back pressure valves, and pop safety valves.

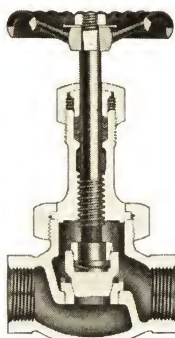
Pipe bends are made in any required sizes for all requirements.

Estimates are furnished for complete piping equipment for any plant.

Crane *Catalogue* and other Crane publications contain engineering data of practical help in making calculations for the piping of steam, water, gas, oil ammonia, etc.

## NO. 382-P BRASS GLOBE VALVE:

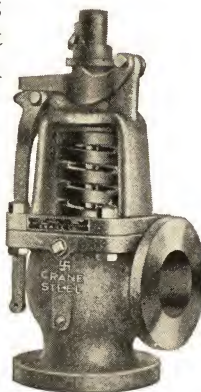
For working pressures up to 300 lbs., and total temperatures up to 550° Fahrenheit. This valve is particularly suited for throttling under high pressures and temperatures. Its plug type seat and disc not only permit finer regulation of the flow, but stay tight over much longer periods. Larger seating contact makes for greater resistance to wire drawing and erosion from foreign matter in lines. The disc is of Crane Nickel Alloy; the seat-ring of Exelloy; disc and stem are locked to prevent disc detaching itself from stem when valve is in service.



No. 382P

## POP SAFETY VALVES, CAST STEEL:

Body and yoke are cast steel; mountings are monel metal; spring is outside and made of special spring steel. High lift and large discharging capacity. Sizes from 1½ to 4½ inches.



No. 117A

## MOTOR OPERATED GATE VALVES

A dependable motor drive can be supplied on any Crane gate valve of 2-inch size or larger.

The motors used are especially designed for valve operation and are furnished for all standard voltages, D. C. and A. C.

Crane motor operated gate valves have a cushioning feature which protects the valve seat against damage and the motor against overload at the extremities of the gate travel.

## NO. 30E AUTOMATIC STOP CHECK VALVE:

For saturated steam working pressures up to 250 lbs., and temperatures up to 500°.

As an assurance of safety, and as a protection against losses, this automatic stop check valve No. 30E is invaluable. It will act as a non-return valve, preventing the backflow of steam from the main to the boiler in the event a tube is blown out. It will act as a safety stop valve when men are working in the boiler. More, it offers an excellent method of detecting sluggish boilers for it does not open until the boiler has reached the full pressure of the line. Similar valves available in cast steel for high pressure superheated steam.

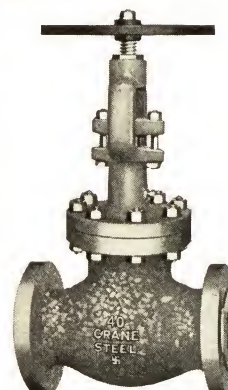


No. 30E

## GLOBE VALVES, ELECTRIC CAST STEEL:

This Crane Series 40 cast steel globe valve is for steam working pressures up to 400 lbs. and temperatures to 750° Fahrenheit; for hot oil working pressures up to 375 lbs. and temperatures to 900° and for oil, water, air or gas working pressures up to 500 lbs. at atmospheric temperature. For boiler feed working pressures up to 500 lbs.

Other Series valves are available for higher and lower pressures.

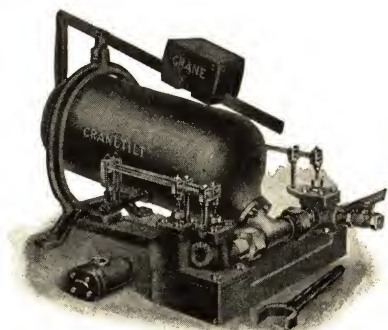


No. 161P or X



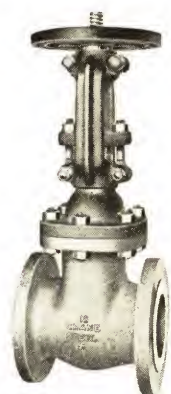
## CRANETILT STEAM TRAPS:

Direct return, non-return and lifting-type traps are supplied for steam working pressures up to 250 lbs. All working parts are outside. Their valves have full discharging capacity.



## GATE VALVES:

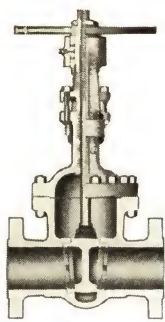
The valves illustrated below cover every requirement of superheated steam at pressures between 150 and 1500 lbs., and of hydraulic pressures up to 3000 lbs. They embody the latest principles of valve design and meet the new A.S.A. standards.



150 Lb., W.P., Steam

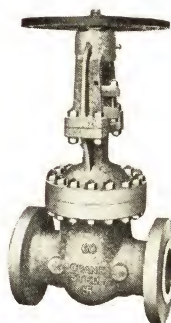


300 Lb. W.P., Steam

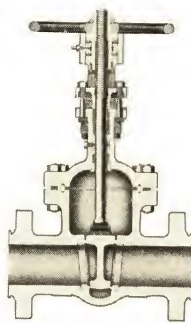


400 Lb. W.P., Steam

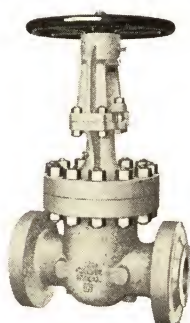
Their bodies and bonnets are cast or forged steel, and stems are Exelloy (Stainless Steel). The seating surfaces are made of a combination of Nitralloy and Exelloy for steam service. For oil service, all seating surfaces are of Exelloy. These valves also are available in Alloy Cast Steels.



600 Lb. W.P., Steam



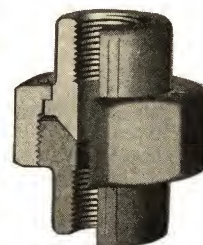
900 Lb. W.P., Steam



1500 Lb. W.P., Steam

## FORGED UNION:

Designed and built for high pressures and temperatures, this No. 246H Union is made entirely of forgings. The thread piece is forged Monel Metal; the tail piece and union ring are forged steel. The ground joint, non-corrosive seat stays tight under the hardest service. For superheated steam or hot oil at 900 lbs., 750° Fahrenheit, for hot oil at 725 lbs., 1000° Fahrenheit, for cold water, oil and gas at 3000 lbs.



No. 246H Union

## SCREWED AND FLANGED FITTINGS:



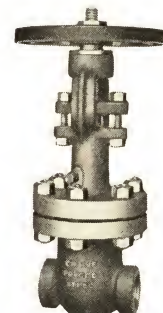
Screwed and flanged fittings of cast steel and screwed fittings of forged steel are supplied for all pressures provided for in Crane cast and forged steel valves.

## FORGED STEEL VALVES:

Crane offers a line of forged steel gate, globe, angle and check valves of distinctive design. Highly improved manufacturing processes make these valves an outstanding improvement for controlling fluids under high pressure and temperature.



No. 176-X or P  
Globe Valve,  
Screwed End,  
Bolted Bonnet



No. 80-XN or X Gate  
Valve, Screwed End,  
Bolted Bonnet

Screwed and flanged end. Bolted bonnet and union bonnet. Bolted bonnet valves particularly recommended for superheated steam service. These valves are designed and built to withstand severe working conditions. All bolted bonnet valves have outside screw and yoke.



# CROSBY STEAM GAGE & VALVE CO.

10 ROLAND ST., BOSTON, MASS.

DISTRICT SALES OFFICES

BOSTON, MASS.

CHICAGO, ILL.

NEW YORK, N. Y.

SAF FRANCISCO, CAL.

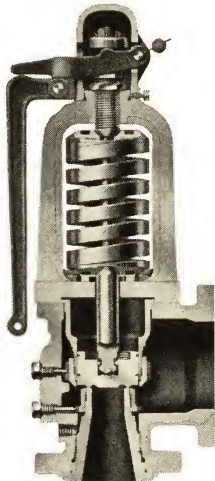
LONDON, ENG.

Sales Representatives in Other Industrial Centers

## POP SAFETY VALVES:

For pressures to 2000 lb. and temperatures to 1000° F.

**Outstanding Features of Design:** (1) Nozzle throat, an exclusive feature, offers minimum resistance to discharge of fluid and insures maximum efficiency of flow through valve. (2) Lift provides full opening and maximum nozzle capacity within allowed 3% accumulation. (3) Operation gradual in its opening and closing, avoiding shock. (4) Nozzle seat and disc of special forged alloy steel, particularly resistant to erosion and corrosion. (5) No guides to obstruct discharge through throat. (6) Seat threads never under boiler pressure.



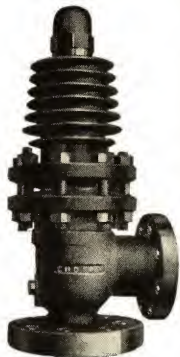
Style	Body	Size, In.	Max. Press.	Max. Temp.
HN-2	Steel	1½	600	800°F.
HN-2	Steel	3	600	800°F.
HN-3	Steel	3	900	800°F.
HN-5	Steel	1½	900	800°F.
HN-5	Steel	3	900	800°F.
HN-6	Steel	3	1500	800°F.
HN-7	Steel	3	2000	800°F.
HN-9	Steel	6	400	750°F.
HO-1	Iron	1½-4½	250	Sat. Steam
HO-1	Iron	6	200	Sat. Steam
HS-1	Steel	1½-4½	300	650°F.
HS-2	Steel	1½-4½	300	650°F.
HS-2	Steel	4½	450	650°F.
HSA-1	Steel	1½-4½	300	750°F.
HSA-1	Steel	6	300	750°F.
HSA-2	Steel	1½-4½	450	750°F.
HRI-B	Iron	2-4½	250	Sat. Steam
HRI-C	Steel	2-4½	350	Sat. Steam
HH	Bronze	½-1½	250	.....
HH	Bronze	2-2½	250	.....

Crosby Valves meet code and all State law requirements.  
HR—A special low capacity design for return tubular boilers.

**Note:** Crosby Pop Safety Valves meet all requirements of A.S.M.E. code, state laws and Canadian registration.

## CROSBY RELIEF VALVES:

Crosby Relief Valves are extensively used for vapor or liquid on tanks, pumps, compressors, stills, natural gas, air, oil and gasoline lines. Different designs are made for various services. Standard valves in iron, steel or bronze for all pressures up to 16,000 lb. and for temperatures to 900° F. All models except JA and JH, which are made of bronze, have renewable seats; special metal for special service.



## FULLWAY VALVES:

A valve of the swing gate type for boiler blow-off and general service.

### Special Features:

(1) Positive stop outside of valve which acts directly on lever.

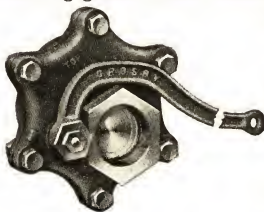
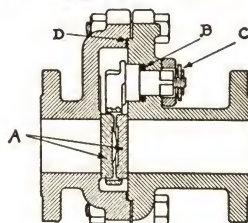
(2) Two separate discs "AA" are held apart and in constant contact with their seats by a conical spiral spring. Each disc is free to find its own seat, being separate from and loosely held by the stirrup-like disc holder.

(3) "B" solid ring packing and "C" adjustable tension spring prevent leakage.

(4) Body is fitted together with male and female joint "D" insuring accurate alignment and preventing gasket from blowing out. Body is so designed that seats can be refinished in a lathe—discs also can easily be refaced.

(5) All parts are renewable and interchangeable, which means durability, low cost and convenience of repair.

**Sizes and Styles:** Made in sizes 1¼ to 3 in., screwed or flanged, with simple or compound levers or hand-wheel, for pressures up to 300 lb.



## INDICATING GAGES:

Both single and double tube types in all sizes and styles for both pressure and vacuum.

**A New Design High Pressure Steam Gage:** Has lathe turned tubes attached to socket and tips by screwed joints—no solder used. Double tube type only. Sizes 6 to 16 in. Pressures 100 to 1500 lb.



## STEEL TUBE GAGES:

This type gage has forged movement with case-hardened sector and pinion, forged steel socket and tip, steel tube. Designed for use on high temperatures and to indicate pressures with test gage accuracy.



## RECORDING GAGES:

For steam, gas, air, water, ammonia, etc. Iron or brass cases. Sizes 6¾, 8½, 10 and 12 in. Charts produced by special process insure against errors often occurring in printing of ordinary charts.



Special recorder for hydraulic presses.

## GAGE TESTERS:

Our fluid pressure gage testers are designed and constructed on scientific principles and are standards of mathematical accuracy.

**Dead Weight Type:** In this type weights are placed directly on an hydraulic plunger communicating with the gage and hand pump. The exact pressure corresponding to each weight is marked thereon.



**Scale Type:** This differs from the Dead Weight Tester, instead of adding up the weights to obtain the pressure, it is read directly from the scale beam. The awkwardness of handling a heavy stack of rotating weights is avoided. This instrument operates like an ordinary weighing scale; requires less time and is easier to operate. It reads in one pound steps and is very accurate.

A large instrument of the same type is made for testing gages to 25,000 lb.



## OTHER PRODUCTS:

Also chime whistles, electrically and manually operated whistle valves, Crosby improved spring-seat globe, angle and check valves, gage boards, Engine Indicators, Planimeters.



## DAVIS REGULATOR COMPANY

2547 SOUTH WASHTENAW AVE., CHICAGO, ILL.

*Manufacturers of  
Automatic Pressure and Flow Control Equipment for Pipe Lines*  
NEW YORK OFFICE: 250 PARK AVE.  
Sales Representatives in Principal Cities



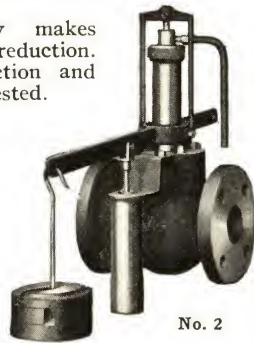
No. 15

### NO. 15 PRESSURE REGULATOR:

For reducing high pressures to low service pressure as in heating. Has interchangeable diaphragm head, deep water seal and no packing box. Globe and expanded outlet patterns.

### PRESSURE REGULATOR—PISTON TYPE (No. 2):

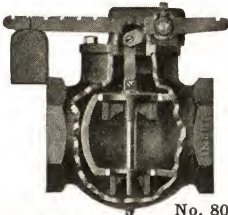
Automatically makes any pressure reduction. Has visible action and may be hand tested.



No. 2

### BACK PRESSURE VALVE (No. 80):

A noiseless, double ported, semi-balanced valve for maintaining pressure of 20 lb. or less. Brass seat bushing rings and iron disc prevent sticking. A patented construction. Globe pattern may be used horizontally or vertically. Angle pattern made to order.



No. 80

### NO. 21 BRASS BODY WATER PRESSURE REDUCING VALVE:

A spring loaded diaphragm valve with single seat and renewable composition disc. Port area is full pipe size. Cushioned action. Tight when closed. Pressure reduction maintained regardless of flow. Used extensively for maintaining the right pressure on plumbing fixtures and wherever a reduced water pressure is required. Sizes  $\frac{1}{2}$  to 2 in.

### NO. 13 PRESSURE REDUCING VALVE:

A compact self contained valve suitable for steam, air and gas pressure reduction. Has single seat, spring loading and built-in strainer. Closes tight. Maintains reduction regardless of circulation. The phosphor bronze diaphragm has a limited movement which makes necessary a restricted port area. Recommended for conditions requiring less than full pipe capacity. Sizes  $\frac{3}{8}$  to 2 in.



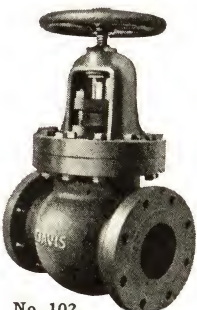
No. 13



No. 21

### FLOAT VALVE—GLOBE AND ANGLE PATTERNS (No. 60):

Used on makeup line to open tank—maintains constant level. Has no internal packing—closes tight. Will not stick.



No. 102



No. 60

### NO. 102 STOP AND CHECK VALVE:

Used on boilers in series to automatically prevent a reverse flow of steam into a disabled boiler. Cylindrical form of disc guided by ribs and stationary piston, which are part of the seat ring, makes a rigid construction free from expansion troubles. The action is effectively cushioned. Globe, angle and elbow patterns for all pressures.

## DETROIT ELECTRIC FURNACE CO.

825 W. ELIZABETH ST., DETROIT, MICH.

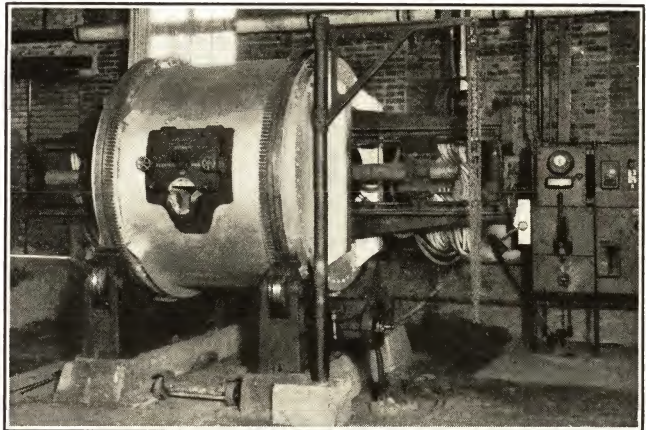
Phone: Cadillac 8180

Cable: "DEFECO"

*Manufacturers of Detroit Rocking  
Electric Furnaces*

## METAL MELTING FURNACES

Used for melting all types of ferrous and non-ferrous metals and alloys. Including brass, bronzes, bearing metal mixtures, copper, aluminum, nickel, iron, alloy steels and special alloys.



Type CC—600 KW—3000 Lb.  
Detroit Rocking Electric Furnace

Furnaces are of the indirect arc, horizontal electrode, automatic rocking type.

They provide unusual speed, flexibility, and over-all economy.

They permit the utilization of cheaper raw materials and assure superior quality products by reason of the accurate control over temperature and composition, the absence of oxidation, and the homogeneous bath, which results from the automatic rocking action, stirring the metal while melting.

On ferrous melting operations outstanding improvements in the final product result through the ease and accuracy with which a high degree of superheat is obtained, and through the ability to produce any desired composition by simple adjustment of the furnace charge.

Advantages in non-ferrous melting accrue through the low metal losses, rapid melting and superior quality of alloy resulting in a higher percentage yield of perfect castings.

*Literature and prices on request.*



# DAYTON-DOWD COMPANY

QUINCY, ILL.

*Manufacturers of Centrifugal Pumps*

Offices in Fifty-one Cities

## PRODUCTS:

TYPE CSLH, SINGLE STAGE, LOW PRESSURE PUMPS (Bul. 267).

TYPE CS, SINGLE STAGE, HIGH PRESSURE PUMPS (Bul. 267).

TYPE CSD, MULTISTAGE PUMPS, automatically balanced (Bul. 300).

TYPE CSF, SINGLE STAGE, APPROVED UNDERWRITERS' FIRE PUMPS (Bul. 500).

TYPE CSDF, MULTISTAGE, APPROVED UNDERWRITERS' FIRE PUMPS (Bul. 500).

TYPE CSB, APPROVED UNDERWRITERS' BOOSTER PUMPS (Bul. 500).

TYPE SB, SINGLE SIDE SUCTION SMALL PUMPS—belt drive (Bul. 700).

TYPE NH, SINGLE SIDE SUCTION SMALL PUMPS—motor drive (Bul. 800).

TYPE D SINGLE-SIDE SUCTION PUMPS (Bul. 801).

TYPE HR, AUTOMATIC CONDENSATE PUMPS and RECEIVERS (Bul. 900).



TYPE SSV, AUTOMATIC SUMP PUMPS and EJECTORS (Bul. 1102).

TYPE CST, TANK FILLING PUMPS (Bul. 600).

TYPE TF, TURBINE BOILER FEED UNIT (Bul. 265).

TYPE CV, NON CLOGGING VERTICAL SEWAGE PUMPS (Bul. 1201).

TYPE CH, NON CLOGGING HORIZONTAL SEWAGE PUMPS (Bul. 1201).

SPECIAL DESIGNS FOR SPECIAL SERVICES.

## ENGINEERING SERVICE:

DAYTON-DOWD COMPANY is an organization of centrifugal pump specialists. They manufacture no other type of pumps but centrifugal and, through an experience extending over many years, have accumulated a wealth of information with reference to pumping problems which is at the disposal of pump users everywhere.

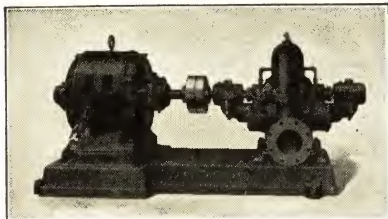
Our engineers, at the Home Office and in fifty-one district offices who are trained in the application of centrifugal pumps, will be glad to have you consult with them concerning specific pumping problems.

## DAYTON-DOWD PUMPS

**Scope of Application:** Dayton-Dowd centrifugal pumps are built in a wide range of sizes, from  $\frac{3}{4}$ -in. discharge up to and including 48-in. discharge, for practically any pressure. They are built in cast iron, cast steel and bronze alloys to meet any operating conditions.

Dayton-Dowd pumps are in use for general water supply, boiler feed, water works and filtration plants, sewage, pumping stations,

house pumping service, heating pumps, elevator pumps, automatic condensation return pumps, Underwriter approved centrifugal fire pumps, booster pumps, tank filling pumps, sugarhouse pumps for all services, chemical pumps, filter press pumps, mine pumps, condenser pumps, oil refineries pumps for handling oils, gasoline, distillate, etc., ice and refrigeration system pumps, paper mill pumps, drainage and irrigation pumps and many other services.



### Type CS:

FIG. 307: Single Stage, Double Suction, Bronze Fitted, Split Case, Motor Driven Pump.

Built in sizes from  $1\frac{1}{4}$ - to 48-in. discharge for pressures up to 240 ft.

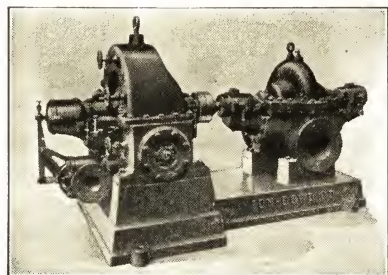


FIG. 123: Single Stage, Double Suction, Bronze Fitted, Split Case Pump Driven by Direct Connected Steam Turbine.

Built in any size and for high speeds and high pressures.

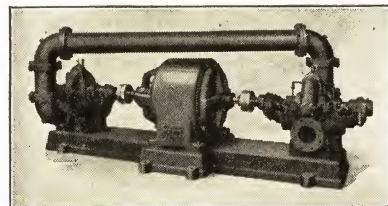
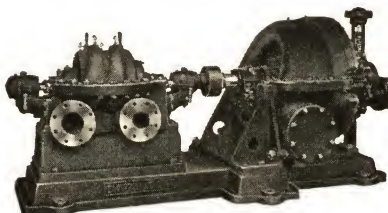


FIG. 293: Single Stage, Double Suction, Bronze Fitted Pumps Connected in Series with Motor Mounted between Pumps.

Especially efficient at motor speeds for high pressure service.



### Type CSD:

FIG. 405: Multistage, Automatically Balanced, Bronzed Fitted, Turbine Driven Pump for high pressure service.

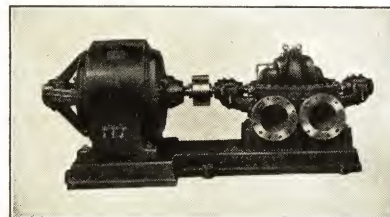


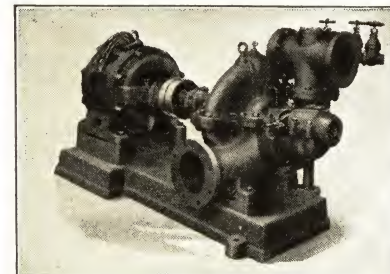
FIG. 341: Multistage, Automatically Balanced, Bronze Fitted, Motor Driven Pump for high pressure service.

This type may be furnished in any number of stages from 2 to 5 for very high pressures.

### Type CSF:

FIG. 303: Single Stage, Approved Underwriters' Centrifugal Fire Pump Driven by Electric Motor.

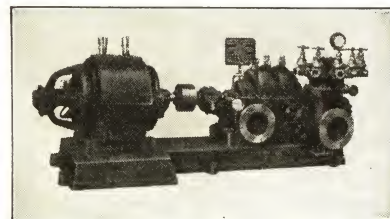
Built in sizes 500, 750, 1000 and 1500 gal. for both motor and steam turbine drive.



### Type CSDF:

FIG. 444: Multistage, Approved Underwriters' Centrifugal Fire Pump Driven by Electric Motor.

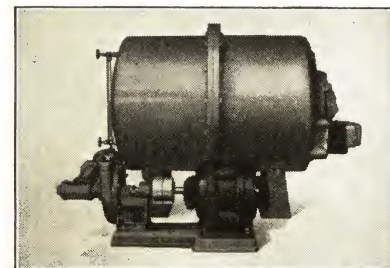
May be supplied also for steam turbine or gas engine drive. Built in sizes 500, 750, 1000 to 1500 gal. for any pressure required for this service.



### Type HR:

FIG. 379: Automatic Condensate Return Pump and Receiver.

Built in a wide range of sizes and pressures.





# DE LAVAL STEAM TURBINE COMPANY

MAIN OFFICES AND WORKS: TRENTON, N. J.

ATLANTA  
BOSTON  
CHARLOTTE  
CHICAGO  
CLEVELAND  
DENVER

DULUTH  
HAVANA  
HELENA  
HOUSTON  
KANSAS CITY

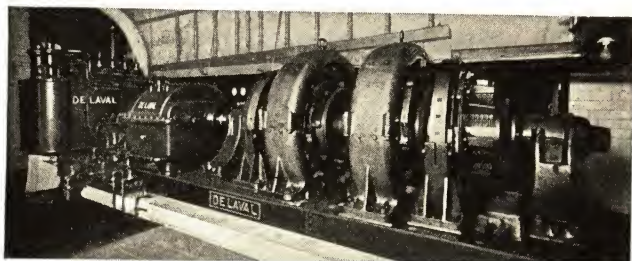
SALES OFFICES  
LOS ANGELES  
MANILA  
NEW ORLEANS  
NEW YORK  
PHILADELPHIA

PITTSBURGH  
ST. PAUL  
SALT LAKE CITY  
SAN FRANCISCO  
SEATTLE

TULSA  
EDMONTON  
MONTREAL  
TORONTO  
VANCOUVER

## PRODUCTS:

Steam Turbines; Centrifugal Pumps; Propeller Pumps; Rotary Displacement Pumps; Centrifugal Blowers and Compressors; Helical Speed Reducing Gears; Worm Gears; Water Turbines; Flexible Couplings, and special centrifugal machinery.



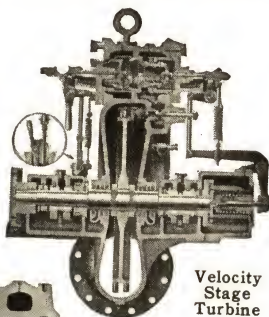
1000 Kw. Geared Turbine Driving D.C. Generating Set; Steam Extracted for Process and Heating

## STEAM TURBINES:

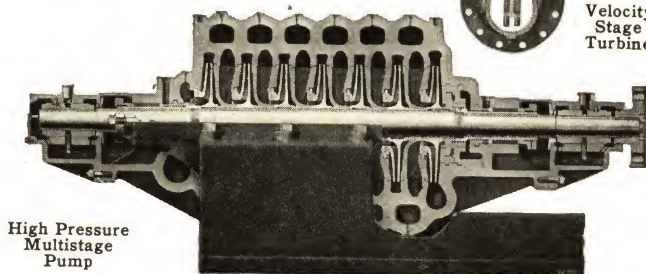
De Laval turbines are built for all steam conditions, including high pressure, condensing and non-condensing, back pressure, bleeder and mixed flow service. Adapted to driving machines at all speeds, either directly connected or through the DE LAVAL DOUBLE HELICAL SPEED REDUCING GEAR.

De Laval Velocity Stage Turbines, designed to operate on high pressure, high temperature steam, are built in all sizes up to 1200 hp.

De Laval Pressure Stage Turbines are built in capacities up to 15,000 hp., and give the highest obtainable efficiencies.



Velocity Stage Turbine

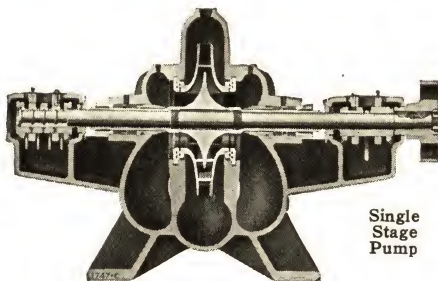


High Pressure Multistage Pump

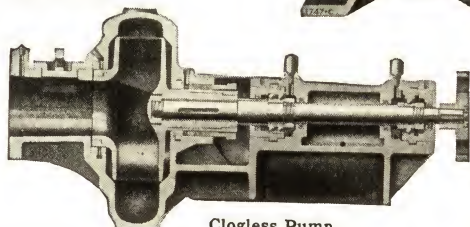
## CENTRIFUGAL PUMPS:

De Laval Centrifugal Pumps are characterized by conservative speeds and high class materials and construction.

All parts are made to limit gages on an interchangeable basis.



Single Stage Pump

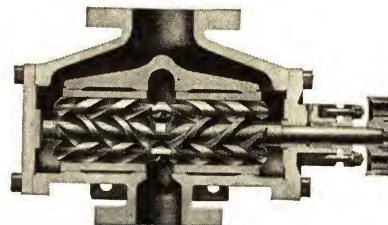


Clogless Pump

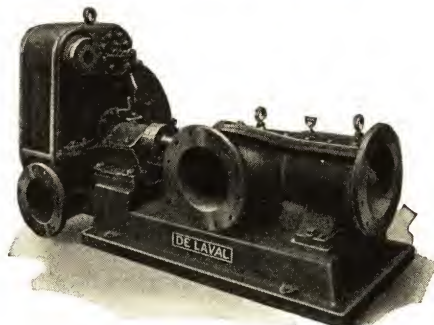
The De Laval Labyrinth Wearing Rings maintain the original efficiency for long periods.

De Laval-IMO Rotary Displacement Pumps, directly connected to standard speed turbines and motors, pump against pressures up to 500 lb. and over, with high efficiency and without noise or vibration.

De Laval Propeller Pumps, running at electric motor and steam turbine speeds, deliver large volumes against heads up to 40 feet.



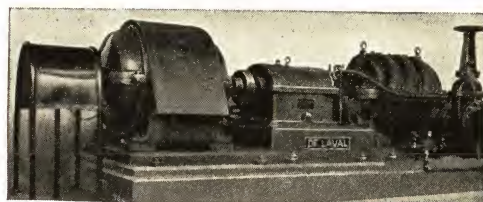
Section of De Laval-IMO Pump



Propeller Pump Driven by Steam Turbine

## CENTRIFUGAL BLOWERS AND COMPRESSORS:

Are built single stage and multi-stage, and for motor or turbine drive, for all pressures up to 100 lbs. per sq. in.



Centrifugal Compressor Driven Through Speeding Up Gear by Standard Speed Motor. 6500 cu. ft. per min. against 12 lbs. per sq. in. at 4900 r.p.m.; motor speed 1800 r.p.m.

## DE LAVAL WORM REDUCTION GEARS:

Uses: The De Laval WORM REDUCTION GEAR is a superior, modern speed reducer for use with electric motors or steam turbines driving slow or moderate speed machinery. It is efficient, compact, silent, entirely self-enclosed and self-lubricating, and immune to moisture and grit.

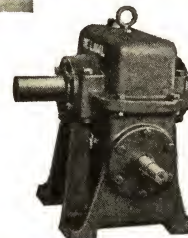
Design: The De Laval Worm Reduction Gear differs from ordinary worm gearing in the correct tooth shape, the high class materials used, the heat treatment of the materials and the manufacturing methods and shop control.

The parts of De Laval Worm Reduction Gears are interchangeable throughout, and are so arranged that they can easily be disassembled.

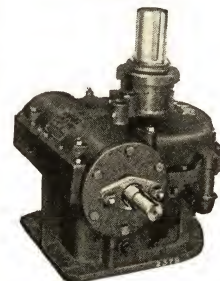
Types: The De Laval Worm Reduction Gear is built with the driving worm either at the top or at the bottom, and with the driven machine either at the right or the left. Vertical shaft drives are also supplied, with the shaft extending above or below. Single reductions are built for ratios up to 100 to 1, while double reductions provide for ratios up to 8000 to 1.

## GUARANTEES:

All De Laval apparatus is built on a limit gage, interchangeable basis and finished repair parts are supplied, made to accurate dimensions. The performance of every machine is guaranteed, both as to capacity and efficiency, and is determined by tests at our works.



Bottom Drive Worm Reduction Gear with Anti-friction Wheel Shaft Bearings



Worm Reduction Gear for Vertical Shaft Drive. Also Made with the Wheel Shaft Brought Out at the Bottom



# DEAN BROTHERS CO.

Established 1869

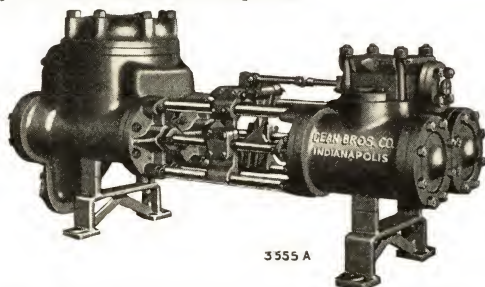
331 WEST TENTH STREET, INDIANAPOLIS, INDIANA

BRANCH OFFICES: NEW YORK, N. Y., PHILADELPHIA, PA., CHICAGO, ILL., HOUSTON, TEXAS. Representatives in Principal Cities

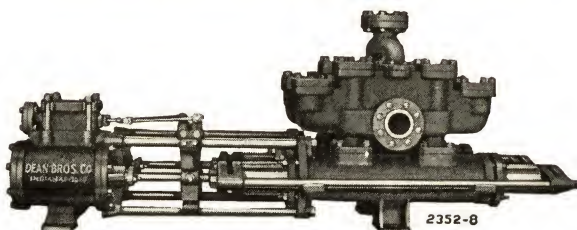
*Manufacturers of Steam and Power Driven Reciprocating Pumping Machinery*

## "DURABLE" DUPLEX BOILER FEED PUMPS:

DEAN BROS. "Durable," duplex pumps are equipped with our patented valve gear giving close clearance in steam cylinders and positive stroke on each side resulting in quiet operation, high efficiency and less steam consumption.



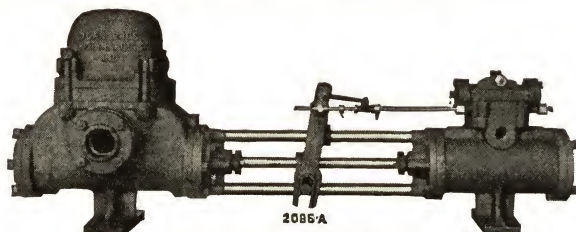
Piston Type, Removable Liner, Pressures up to 300 Lbs.



End Packed Plunger, Pressures up to 400 Lbs.

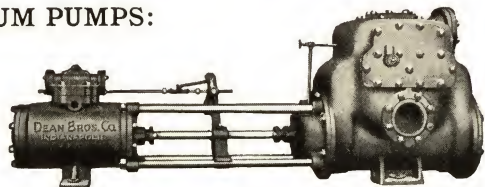
## SINGLE STYLE PUMPS:

Where the service requires single style pumps DEAN BROS. can furnish pumps in all capacities and sizes and for special purposes such as vacuum, magma, high pressure hydraulic, etc.



Single Style Pressure Pump

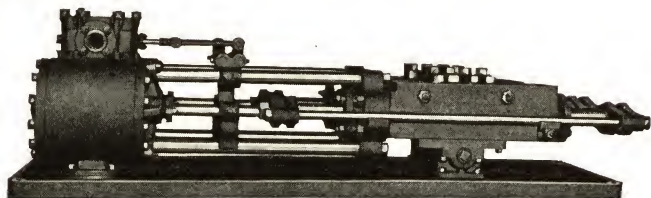
## VACUUM PUMPS:



One-Piece Cylinder Type with Water Sealed Stuffing Box.  
Vacuums up to 26 Inches

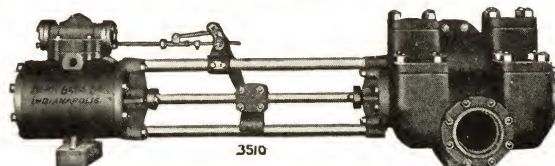
## HYDRAULIC PUMPS—Single-Duplex and Power:

DEAN BROS. hydraulic pumps have pump ends of forged steel, all passages being machined from the solid. They are practically unbreakable.



"Durable" Duplex Hydraulic Pump—Pressures up to 12,000 Lb.

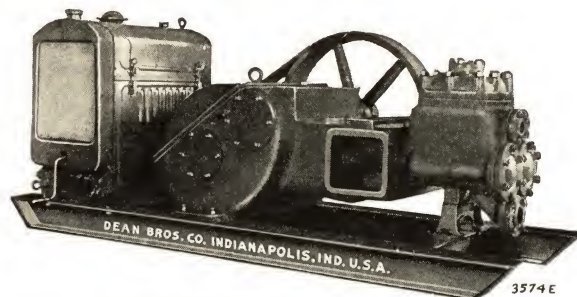
## CLOSE CLEARANCE PUMPS:



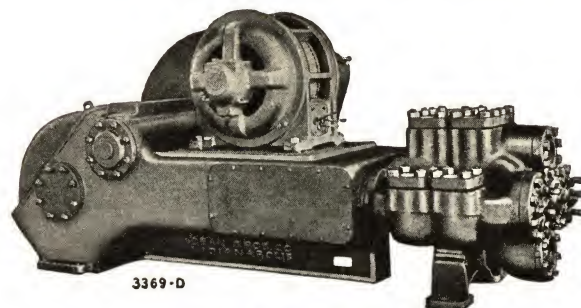
Close Clearance Pump for Gasoline, Etc.  
A Special Pump for All Volatile Liquids

## POWER DRIVEN PUMPS:

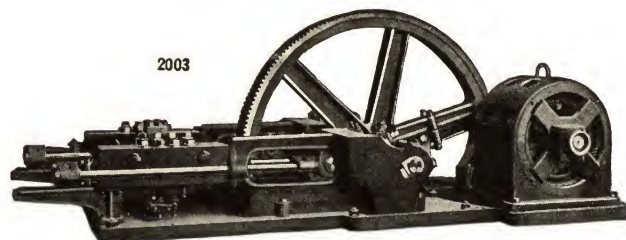
DEAN BROS. build a line of reciprocating power pumps—single, duplex and triplex, in many sizes in both open frame and oil enclosed design. Pumps can be arranged for any type of drive.



Oil Bath Roller Bearing Duplex Power Pump  
Valve Plate and Cover Pattern Gas Engine Drive



Oil Bath Roller Bearing Power Pump  
for Heavy Pressure Service



Power Duplex Hydraulic Pump  
with Forged Steel Cylinders

## SPECIAL PUMPING MACHINERY:

DEAN BROS. have a wide range of pattern equipment and can build almost any type of reciprocating pumping machinery.

An experienced engineering staff to design pumps for special services and a well equipped factory insure satisfaction.



# DEAN HILL PUMP COMPANY

ANDERSON, INDIANA

*Manufacturers of Centrifugal Pumps and Steam Turbines*

## BRANCH OFFICES

NEW YORK      CHICAGO      HOUSTON

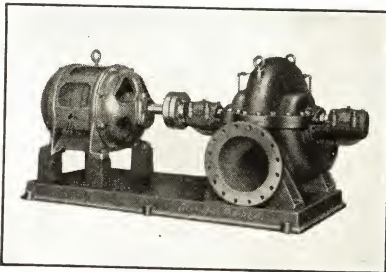
### PRODUCTS:

Double Suction Single Stage Pumps  
Multi Stage Volute and Diffuser Pumps  
Single Suction Horizontal and Vertical Pumps  
Single Suction Nonclogging Pumps  
Sump Pumps, Single and Duplex Units  
Fire Pumps, Single and Multi Stage  
Reciprocating Deep Well Pumps

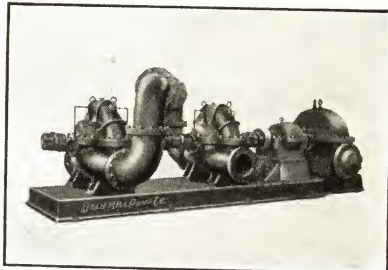
Centrifugal Deep Well Pumps  
Steam Turbines, Horizontal and Vertical

### SPECIAL PUMPING UNITS:

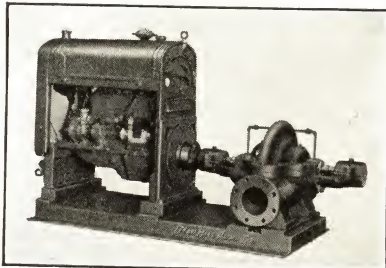
Dean Hill pumps cover a wide range of application and special equipment is available for handling any liquid that will flow. The company offers the services of its engineers for consultation and advice on any problems or new application.



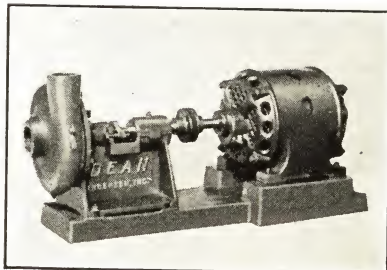
Double Suction Motor Driven Pump



Double Suction Series Unit



Double Suction Engine Driven Pump



Single Suction Pump

**DOUBLE SUCTION MOTOR DRIVEN PUMPS**  
Single stage double suction split case pumps, built in sizes 1" to 30", motor or turbine drive, capacity up to 30,000 G.P.M.

**DOUBLE SUCTION SERIES UNITS**  
Single stage double suction pumps in series, sizes 1" to 30", motor or turbine drive, for high heads, capacity up to 30,000 G.P.M.

**DOUBLE SUCTION ENGINE DRIVEN PUMPS**  
Single stage double suction pumps in any size and for capacities and heads within the range of commercial engines.

**SINGLE SUCTION PUMPS**  
Single stage single suction pumps in sizes 1" to 4" for motor, engine, turbine or belt drive, heads up to 100 feet.

**DEEP WELL PUMPS**  
For 6" wells and larger, motor, turbine or belt drive for capacities up to 3000 G.P.M.

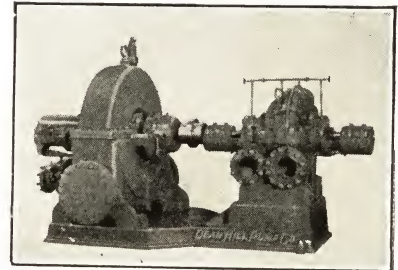
**SUMP PUMPS**  
Single and duplex units, enclosed, open or non-clogging impeller, for wet or dry sumps.

**MULTI STAGE PUMPS**  
Multi stage hydraulically balanced pumps, motor, turbine, engine or belt drive, 2 to 6 stages.

**HIGH PRESSURE MULTI STAGE PUMPS**  
Multi stage hydraulically balanced pumps, boiler feed and hydraulic service, heavy pattern, 2 to 8 stages, motor or turbine drive.

**UNDERWRITERS FIRE PUMPS**  
Single stage and multi stage fire pumps, 500, 750, 1000 and 1500 gallon sizes, motor, turbine or engine drive.

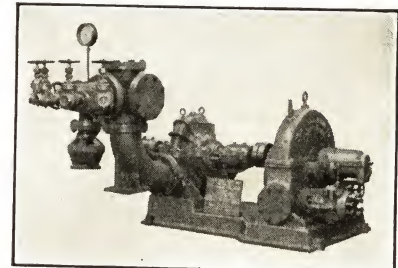
**STEAM TURBINES**  
Single stage impulse turbines, 5 to 500 H.P. up to 300 lb. steam pressure, 25 lb. back pressure, for driving pumps, fans, blowers, etc.



Multi Stage Pump



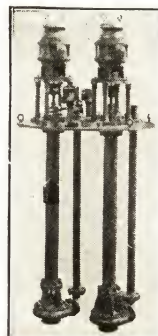
High Pressure Multi Stage Pump



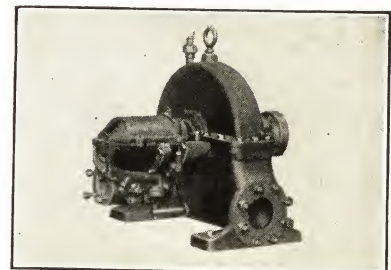
Underwriters Fire Pump



Deep Well Pump



Sump Pump



Steam Turbine



# DETROIT HOIST & MACHINE CO.

8201 MORROW ST., DETROIT, MICH.

NEW YORK OFFICE: 25 Church St., Telephone: Rector 9455

*Manufacturers of Hoists, Cranes, Winches, Pneumatic Motors*

## PRODUCTS:

PNEUMATIC GEARED HOISTS; PNEUMATIC MOTORS; ELECTRIC HOISTS; MONORAIL HOISTS; TRAVELING CRANES; JIB CRANES; WINCHES; PNEUMATIC and ELECTRIC TURNTABLE TRACTORS.

## EXPERIENCE:

This Company is one of the pioneer manufacturers of small power driven hoists. "Detroit" hoists have

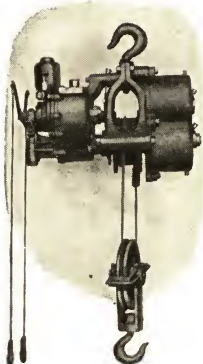
been on the market for more than 25 years, there being thousands in use throughout the world, rendering consistent service. These machines are unsurpassed in simple, accessible design, combined with durability, low initial cost and maintenance.

## INQUIRIES:

Complete specifications and prices gladly furnished. Inquiries should always give capacity, kind of current available and purpose for which hoist is intended.

### GEARED PNEUMATIC HOISTS:

Built for handling loads with 80 to 100 lb. air pressure and consisting of compactly designed pneumatic motor, double oscillating cylinder type, of an unusual, simple design connected through spur gearing through hoist drum and cable. All mechanism running in oil. Capacities,  $\frac{1}{4}$  to 10 tons; speeds: 5 f.p.m., largest size, to 50 f.p.m., smallest size. Lifts, 10 to 20 ft.



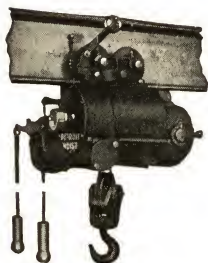
### PNEUMATIC MOTORS:

Same general design as used on hoists except arranged for mounting as a separate motor unit. Motors are reversible, have high torque, will operate with air or steam and built in five sizes from  $2\frac{1}{4}$  to 15 hp.; speeds, 300 to 600 r.p.m. These motors have many applications where electric power is not feasible.



### ELECTRIC HOISTS:

**Type "MW" Electric Hoist:** A compact, strong, light-weight hoist, built in two capacities,  $\frac{1}{4}$  and  $\frac{1}{2}$  ton. Net weight, 175 lb.; headroom,  $12\frac{1}{2}$  in.; for any standard current and any type of suspension. Hoisting speeds, 20 and 40 f.p.m.; 11 to 20-ft. lift. Push button or rope-operated control.

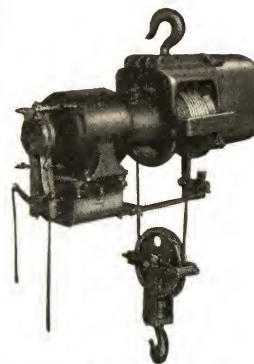


**Type "M" Electric Hoist:** An exceptionally compact and sturdy electric hoist, built in eight capacities:  $\frac{1}{4}$  to 3 tons for any standard current. Net weight, 450 lb.; headroom, 16 in. Furnished for hook, lug, hand trolley or motorized suspension. Hoisting speeds, 15 f.p.m. to 70 f.p.m.; 11 to 30-ft. lift.



### Type "HR" Electric Hoist:

High grade accessibly designed hoist built in twenty sizes, from  $\frac{1}{2}$  to 15 tons, for any standard current. Furnished for hook, lug, hand trolley or motorized trolley suspension. Fully enclosed motor; gearing and mechanical parts all running in bath of oil. Speeds, 8 f.p.m. in largest capacities to 75 f.p.m. in smallest; lifts, 10 to 40 ft.



**Type "LHR" Low Headroom Electric Hoist:** Distinctly a low headroom design, built in same capacities as the Type "HR," having same essential, mechanical and electrical equipment.

Headroom, 19 to 26 in.



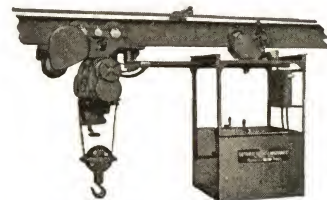
### TRAVELING CRANES:

We build a complete line of medium weight Traveling Cranes in capacities 1 to 10 tons; speeds, up to 50 ft. Illustration shows typical 3-motor crane.



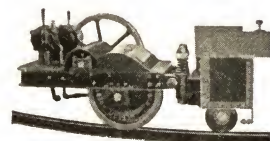
### MONORAIL HOISTS:

Illustration shows typical 2-Motor Cage Operated Monorail. These hoists are manufactured in all sizes and capacities, both floor operated and cage operated.



### PNEUMATIC TURNTABLE TRACTOR:

For railroad turntables; in daily use on over fifty railroads.





# DETROIT STOKER COMPANY

GENERAL SALES OFFICES AND ENGINEERING DEPT.  
GENERAL MOTORS BUILDING, DETROIT, MICH.

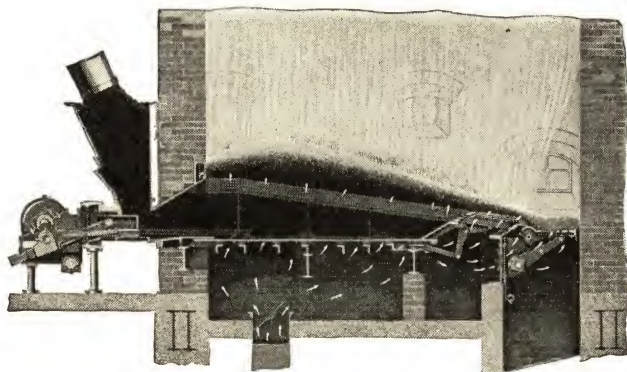
MAIN OFFICE AND WORKS: MONROE, MICH. District Offices in Principal Cities  
DETROIT STOKER COMPANY OF CANADA, LIMITED, CANADA BLDG., WINDSOR, ONTARIO  
Built in Canada at LONDON, ONTARIO

## PRODUCTS AND SERVICE:

**DETROIT STOKERS:** Built in various types and sizes to serve heating and power boilers from approximately 30 hp. upwards. They are also used for special industrial process heating. Bituminous coals, obtainable in all sections, are successfully burned.

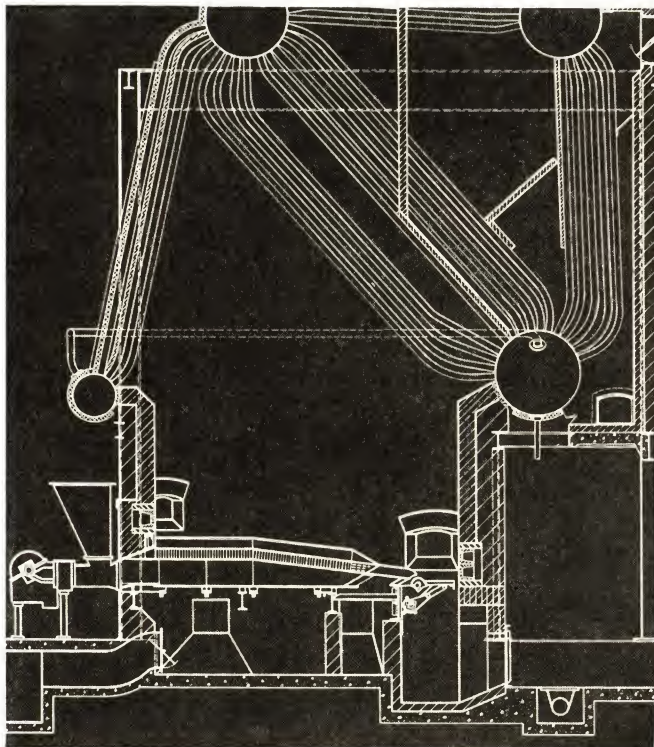
### DETROIT MULTIPLE RETORT STOKER:

For large boilers and high ratings. This stoker efficiently burns bituminous coal from all sections, without expensive preparation. Best results are obtained because of the independent control of the quantity of coal



Detroit Multiple Retort Stoker

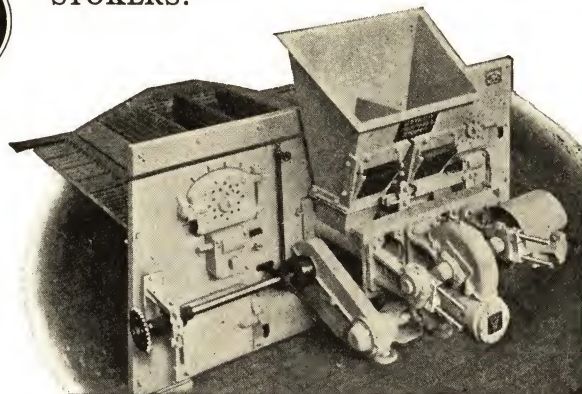
to each retort and the adjustment of the distribution, thereafter. Zoned air is supplied in the proper quantity at various points in the fuel travel. By positive and simple control, with complete underfeed action, a minimum of unburned fuel reaches the ash discharge at rear. The mechanical drives are of simple, advanced design, requiring little power for operation. Power dumps are available for large, high capacity stokers. Preheated air, air cooled or water walls may be used. *Bulletin 159.*



Detroit Multiple Retort Stoker with four drum bent tube boiler designed for 300% rated capacity. Note the unique arrangement of ash removal at the rear without basement or tunnel.



### DETROIT DOUBLE AND TRIPLE RETORT STOKERS:

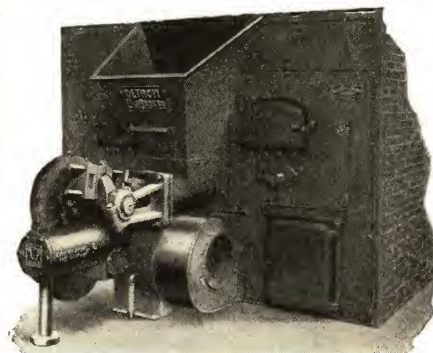


Detroit Double Retort Stoker

In these heavy duty, side-cleaning stokers, independent control of fuel feed and its distribution within the furnace are provided. The slicing action of the distribution bars makes the stoker continuously self-cleaning. They are economically applied to medium sized boilers already in service as no basement is required for ash removal. *Bulletin 459.*

### DETROIT SINGLE RETORT AND UNISTOKER:

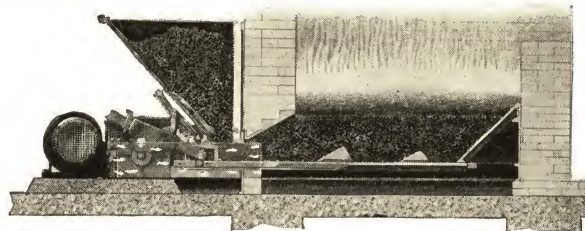
Detroit Single Retort and Detroit UniStokers to serve boilers from 100 to 300 h.p. are heavy duty, mechanically driven, plunger feed, and side cleaning. Positive adjustment of the feed of the fuel and its distribution insures a fuel bed in prime condition. With the Detroit Single Retort Stoker, the Stoker and blower are driven by either a steam engine, turbine or electric motor, automatically controlled. The Detroit UniStoker includes individual motor or turbine driven blower, mounted at each stoker front. *Bulletin 659.*



Detroit UniStoker (Motor or Turbine Driven)

### DETROIT LOSTOKER:

Built in various sizes to fit the furnace. Readily applied to all types of boilers. Burns all grades of bituminous coal. Saves coal and labor. Heavily built for hard, continual service. Automatic in operation. *Bulletin 359.*



Detroit LoStoker

Showing agitator in coal hopper to insure a regular flow of fuel to the plunger, adjustable plunger feed cannot jam or stick with wet coal.



# DEWOLF FURNACE CORPORATION

119 EAST MAIN STREET, ROCHESTER, NEW YORK

Represented in Principal Cities

## PRODUCTS:

STEEL SUPPORTED WALLS; ARCHES; ROOFS, for boilers; furnaces; cracking units; stills; ovens; process units, etc.

AIR COOLED WALLS. INSULATED WALLS.

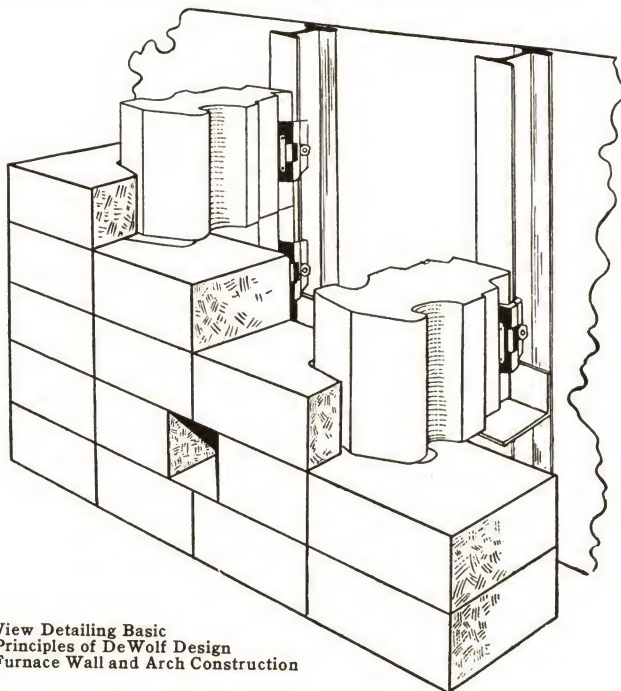


Thus difference between coefficients of expansion and contraction of brick and metal and as well, efficient radiation of heat presents no problem at this point of DeWolf design and eliminates dangers from overheated castings or steel.

## DEWOLF FURNACE WALLS AND ARCHES:

DeWolf Design Furnace Walls and Arches successfully meet the severe operating conditions, higher temperatures, greater expansions and contractions from temperature changes and greater mechanical strains brought about by the present necessary high

Facing bricks can be renewed without renewing hanger bricks. Any portion can be repaired without disturbing the wall above or below. The refractories are sectionally supported.



View Detailing Basic Principles of DeWolf Design Furnace Wall and Arch Construction

furnace ratings, as well as to permit efficient and economical operation of modern fuel burning methods.

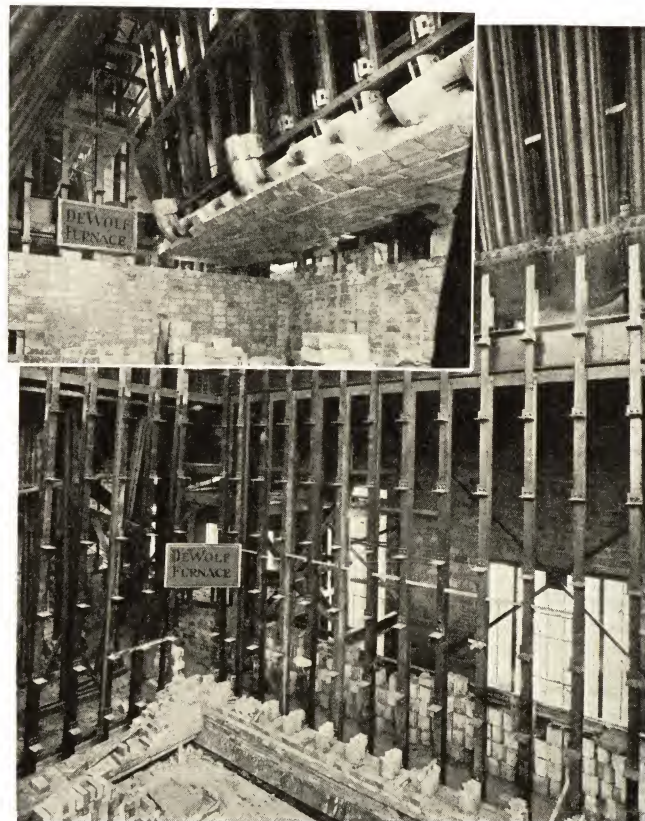
The entire structure is slightly flexible and resilient, correcting a fault of solid fire brick walls which did not permit expansion or contraction and which were extremely difficult to operate under bad slagging conditions.

### Essential Features:

Skeleton design as required by installation of Standard I beams and angles to support DeWolf Design Refractories. Hanger Bricks (DeWolf) attached with cast iron clamps to skeleton. Facing (or lining) bricks fitted into and hooked onto hanger bricks. Covering of transite or suitable material.

**Basic Advantages:** Vertical or horizontal ducts permit pre-heating of air and cooling of walls.

Metal for attaching or supporting bricks is not imbedded in refractories.



Steel Structure Ready for DeWolf Design Refractory. Inset Showing Partially Completed Wall and Arch

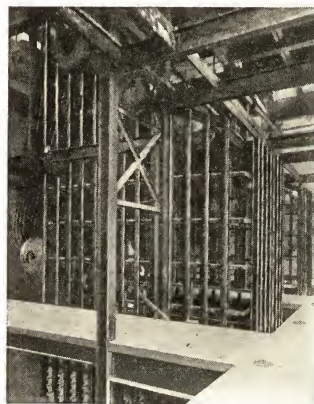
All doors, soot blower heads, etc., bolted directly to steel skeleton frame. Water tubes in boiler circulating system can be installed to reduce temperatures either initially or later, when required, and original refractory costs are not lost.

### Operating Advantages:

Furnaces will successfully handle rapidly changing loads; high ratings; extreme temperatures; severe operating conditions, and are flexible for all present and future requirements.

### ENGINEERING SERVICE:

The manufacturer will gladly co-operate on the preparation of preliminary and final surveys, plans, estimates and will furnish detailed bulletins upon request.



View Showing Comparative Simplicity of Steel Supporting Structure in DeWolf Design Furnace Construction



Completed Construction. Covering of Transite



# DIVINE BROTHERS COMPANY

HOTEL AND WHITESBORO STS., UTICA, N. Y.

CHICAGO, Crown Rheostat & Supply Co., 1910 Maypole Ave.

CLEVELAND . . . . . General Supply Co., 5317 St. Clair Ave.

DETROIT . . . . . Alfred T. Wagner Estate, 2700 Wight St.

*Manufacturers of Automatic Polishing and Buffing Machines, Polishing and Buffing Wheels, also Canvas Cushion Tire Truck Wheels and Casters, TonWate Truck Casters*

## POLISHING AND BUFFING MACHINES:

**Automatic Straight Line Machine:** For polishing and buffing work of approximately flat cross section, as strip and coil stock, automobile bumpers, machine parts, tools, adding machine and typewriter parts, etc. Built on the unit system. As many units can be installed in one machine as are necessary to produce finish desired. Each polishing wheel driven by individual motor, of 5 to 20 h.p. depending on character of work. Work is carried on a feed belt, with a speed range of from 8 to 40 lineal ft. per minute.

Capacity of standard machine, work up to 8 in. wide. Machine may be modified to take work of any width.

**Horizontal Double Head Polishing Machine:** Originally designed for the



polishing of skate blades, this machine is adapted to finish rods, steel flats, and similar surfaces upon both sides at one time. Will take work up to 2 in. wide.

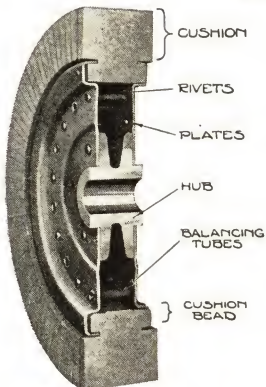
**Special Polishing and Buffing Machinery:** Special purpose machines for any variety of work that is susceptible of automatic or hand polishing. Included in this category are machines for polishing and buffing round, or regularly shaped objects, skate blades, cutlery, etc. Designed and built to fit the work.

## POLISHING AND BUFFING WHEELS:

**Buffing Wheels:** Of full disc, sewed pieced, or special construction. Built to fit the work on which they are to be used. Sewing to specification. All sizes.

**Polishing Wheels:** Of all types and materials for any variety of polishing work. Leather covered wood, felt covered wood, bull-neck leather, solid walrus, disc canvas, wool felt, solid felt, paper, sheepskin, and other wheels.

**CLOTHFLEX POLISHING WHEELS:** For polishing shovels, plows, agricultural tools, stoves, and similar articles. Especially adapted for operations requiring coarse abrasives, and where a soft, flexible wheel is required. Faces can be turned to shape or tapered. Widths of face,



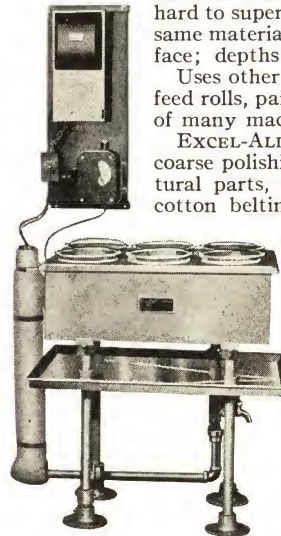
Cross-Section of Compress Type Polishing Wheel

$\frac{1}{2}$  in. to any width desired; standard diameters, 4 to 24 in.

**COMPRESS POLISHING WHEELS:** For practically any variety of flexible grinding or polishing work. Particularly adapted to precision work where extreme accuracy is required. Must be designed and built to fit the work they are to do. Wheel faces can be formed to fit contour of work being finished. Made of leather, canvas, walrus, felt, composition (duck and rubber), paper, cork, and other materials. Densities range from super hard to super soft. Sizes: diameters 4 to 24 in.; in same materials and constructions to 50 in. width of face; depths of cushion, 1 to 4 in.

Uses other than metal finishing: as tension rolls, feed rolls, paint rolls, oiling rolls, and rolls for parts of many machines. Any length roll can be made.

**EXCEL-ALL CANVAS POLISHING WHEELS:** For coarse polishing on cast iron and cast steel agricultural parts, and similar work. Material is thick cotton belting, solid glued construction. Diameters to 24 in., practically any width of face.

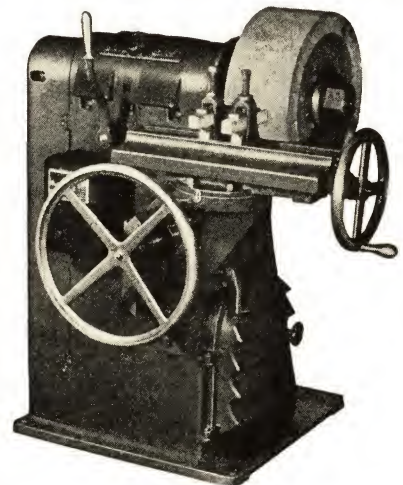


## AUTOMATIC GLUE HEATER:

A glue heater with thermostatic control, to melt and maintain glue at the temperature of maximum strength for setting up of polishing wheels. Heated by steam, gas, or electricity, and regulated to control the temperature within a variation of plus or minus 2° Fahrenheit. Built to accommodate four, six, eight, or twelve glue pots, of 2, 3, 4, 6 or 8 qt. capacity.

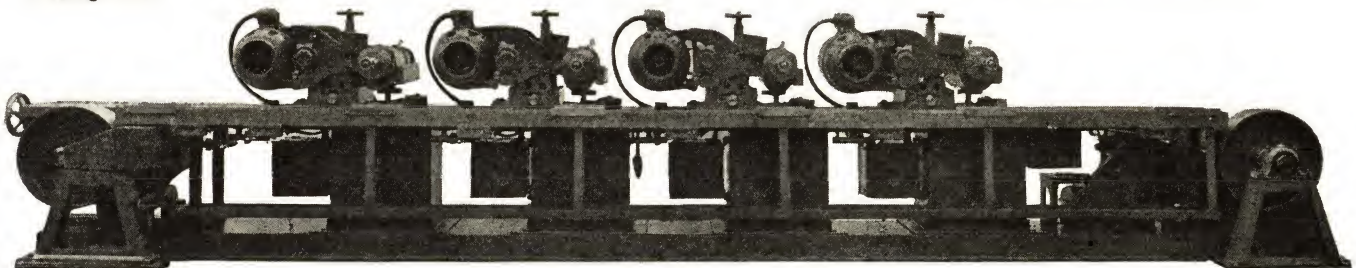
## WHEEL CLEANING AND TRUING MACHINE:

A machine for cleaning the worn abrasive heads from polishing wheels, and for truing the surface of new wheel heads for precision work. Motor driven, with a combined clutch and brake upon the spindle for quick operation. Can be built to clean either by means of steam or carborundum bricks. Both methods can be combined in one machine. Cleans and trues the wheel at operating speed.



## ENGINEERING SERVICE:

A research laboratory is maintained for the investigation and solution of any metal finishing problem or process. A number of trained polishing experts are also available for consultation on equipment, layout, and operation of new or existing plants.



A Four-Unit Straight Line Machine for Polishing or Buffing. Any Number of Units Can Be Provided in One Machine to Meet Production Requirements



# DOEHLER DIE CASTING CO.

GENERAL OFFICES AND ASSEMBLY DIVISION  
TOLEDO, OHIO

Plants at BROOKLYN, N. Y.—POTTSTOWN, PA.—BATAVIA, N. Y.—TOLEDO, OHIO—LOS ANGELES, CAL.  
NEW YORK OFFICE: 386 Fourth Ave.

## PRODUCTS:

Die Castings in brass, aluminum, zinc, tin and lead alloys.

## DOEHLER DIE CASTINGS:

In the production of these parts only virgin metals are used—their purity and conformity with specifications being checked at all stages of the process. The volume of this company's business as the world's largest producer of die castings secures for it the best quality, price and delivery in raw materials—each shipment of which is carefully tested as to quantity and purity. Doehler dies are the work of the most expert and experienced die-cutters—and it is the policy of the company voluntarily to replace worn dies without cost to the customer, that uniformity and accuracy may be maintained. Doehler die casting machines and methods are the result of years of specialization, and assure the maintenance of the Doehler standards.

The company maintains fully equipped laboratories manned by a staff of engineers, chemists and metallurgists—constantly engaged in research and development work and in the study of customers' problems. Doehler Die Castings thus are made right—mechanically, physically and chemically—for the specific purpose for which they are intended.

## BRASS DIE CASTINGS:



The Doehler Die Casting Company has recently added to its production Brass Die Castings *with strength equal to that of Steel*. These are made from "Brastil" (licensed under patents pending) a copper alloy, over 81% copper. "Brastil" has High Strength, High Hardness, Easy Machinability, High Resistance to Fatigue and Shock, Good Bearing Qualities, High Resistance to Corrosion . . . and is of a beautiful White Gold Color.

Its physical properties include:

Tensile Strength (Ult.)	90,000–95,000 Lbs. per Sq. In.
Elongation	10–17% in 2 Inches
Brinell Hardness	160–180 (3000 Kg.)
Weight per Cubic Inch	.29 Lb.

Note also the following comparison of "Brastil" with other industrial metals:

	Tensile Strength, Lbs. per Sq. Inch
60–40 Brass (Sand cast).....	30,000
Cast Iron (Sand cast).....	30,000
Malleable Iron (Cast annealed).....	50,000
Steel Casting (Ordinary Cast).....	50,000
Wrought Iron.....	55,000
Steel Boiler Plate.....	60,000
Steel 0.15 Carbon.....	63,000
Steel 0.50 Carbon.....	80,000
Steel 0.71 Carbon.....	89,000
"Brastil".....	95,000

"Brastil" can be cut, tapped, reamed, drilled and turned . . . also soldered and welded. It offers high resistance to corrosion and, because it will withstand higher loads than ordinary bearing bronzes, "Brastil" is a valuable *bearing metal*.

Test bars and sample castings sent on request. Inquiries invited.



TRADE-MARK

## ALUMINUM DIE CASTINGS:

"ALNILOY" is the name given to the patented alloy used by the Doehler Die Casting Company in the production of "Doehler" aluminum die castings. This alloy contains over 90% of aluminum, alloyed with copper, nickel and silicon. "ALNILOY" will take a fine polish, and retain this polish under ordinary atmospheric conditions.



"ALCULOY" is the name given to the copper aluminum alloys employed by the Doehler Die Casting Company. This alloy is similar to the well known No. 12 Alloy and S.A.E. Specification No. 34 used extensively in the Automotive and Household Utility fields. "ALCULOY" can be polished to high lustre or enamelled.

## ZINC DIE CASTINGS:

In the manufacture of "Doehler" zinc die castings three standard alloys are used.

"DOLER-ZINK" is the name given to the zinc base alloy generally used by the Doehler Die Casting Company where a zinc alloy has a tensile strength of 45,000 pounds per square inch, and about 5% elongation.



## TIN AND LEAD DIE CASTINGS:

The Doehler Die Casting Company manufactures die castings from all commercial alloys of tin and lead, alloyed with copper, antimony, etc. We invite your inquiries and your specifications.

## DELIVERY AND SERVICE:

The company maintains four separate and fully equipped die casting plants, under one policy and management. This affords Doehler customers the advantages and economies of factory facilities not elsewhere to be had—beside the very important consideration of having four separate sources of supply instead of one. Circumstances might conspire to stop production of one plant, but not of four—and production could be taken up by the unaffected plants. Thus, Doehler facilities not only assure delivery as per schedule in any quantity under normal conditions—they safeguard it even against emergency conditions. Doehler Service to customers includes scientific research, the benefits of an unequaled experience, the facilities of the largest production capacity, and in ability to meet all requirements and conditions.

## LITERATURE AND ESTIMATES:

Our new booklet, *Doehler Die Castings*, sent on request.

Estimates will be cheerfully submitted from drawings, models or samples, and Doehler engineers will be glad to work with prospective users of die castings.



# ECONOMY PUMPING MACHINERY CO.

GENERAL OFFICE  
3431 WEST 48TH PLACE, CHICAGO, ILL.

## REPRESENTATIVES

BALTIMORE, MD. . . . . W. I. Collier Co., 522 Park Ave.  
BIRMINGHAM, ALA. . . . . McVoy-Hausman Co., Brown-Marx Bldg.  
BOSTON, MASS. . . . . Emerson Swan Goodyear Co., 110 Arlington St.  
CHARLOTTE, N. C. . . . . Charles M. Setzer Co.  
CLEVELAND, OHIO . . . . . Geo. T. Hill, 2622 N. Moreland Blvd.  
DETROIT, MICH. . . . . Kerr Machinery Co., E. Fort and Beaubien Sts.  
DETROIT, MICH. . . . . Frank R. Patterson, 9201 Boleyn St.  
DENVER, COLO. . . . . Crane-O'Fallon Co., 1631 Fifteenth St.  
HOUSTON, TEX. . . . . Southern Engine & Pump Co., 900 St. Charles St.  
INDIANAPOLIS, IND. . . . . M. D. Mullane, 339 Burgess Ave.  
LITTLE ROCK, ARK. . . . . W. F. Moody & Co., A O U W Bldg.  
LOS ANGELES, CAL. . . . . Smith Booth Usher Co., 2001 Santa Fe Ave.

LOUISVILLE, KY. . . . . Lewis & Hancock Co., 328 Breslin Bldg.  
MEMPHIS, TENN. . . . . Power Equipment Co., 1348 Madison Ave.  
MILWAUKEE, WIS. . . . . C. A. Ekstrom Co., 2540 W. Wells St.  
NASHVILLE, TENN. . . . . W. C. Armistead, 107 Main St.  
NEW YORK CITY, Quimby-Ryan Engineering Sales Co., 1 East 42nd St.  
OKLAHOMA CITY, OKLA., Frank Loeffler Supply Co., 710 N. Hudson St.  
PHILADELPHIA, PA. . . . . Haynes Selling Co., 1518 Fairmount Ave.  
ROCHESTER, N. Y. . . . . John J. McFarlin, 54 Macbeth St.  
SAN FRANCISCO, CAL. . . . . J. Harry Russell, Monadnock Bldg.  
SCRANTON, PA. . . . . John P. Gilboy, Box 214  
SYRACUSE, N. Y. . . . . Syracuse General Sales Co., Yates Hotel Bldg.  
WISCONSIN RAPIDS, WIS. . . . . Badger Sales Co., Mead-Witter Bldg.

## PRODUCTS

**CENTRIFUGAL PUMPS FOR CLEAR LIQUIDS**—Capacities, 0-3000 g.p.m. at 200-ft. head; 0-7500 g.p.m. at 100-ft. head; and 0-400 g.p.m. at 1000-ft. head: Horizontal and vertical designs for various types of drives.

**NON-CLOGGING CENTRIFUGAL PUMPS**—For liquids containing a large percentage of solids or pulpy matter. Horizontal and vertical. Sizes, 2 to 18 in. Capacities, 100 to 20,000 g.p.m.

**SUMP PUMPS**—Automatic for drainage of all kinds.

**SINKING PUMPS.**

**AXIAL FLOW PUMPS**—Horizontal and vertical. Capacities, 150 to 30,000 g.p.m. against low heads.

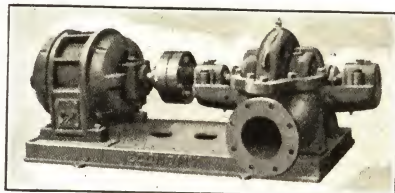
**CONDENSATION PUMPS AND RECEIVERS.**

**RETURN LINE VACUUM PUMPS.**

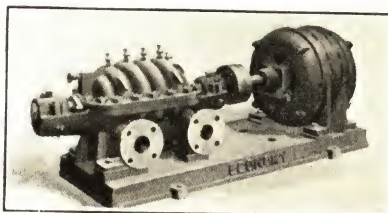
Also Sewage Pumps; Boiler Feed Pumps; Special Pumps for Resale Manufacturers (Single, Tandem, Triple and Quadruple Centrifugal Pumps for all kinds of special services).

## PUMPS FOR CLEAR LIQUIDS

These pumps are suitable for general water supply for buildings, power plants, railroads, and in connection with industrial processes; for pumping all kinds of clear liquids in paper mills, mines and quarries, food industries, cane sugar refineries, chemical processes (acid pumping) and for many other similar applications.



Single Stage, Double Suction Pump



Multi-Stage Pump

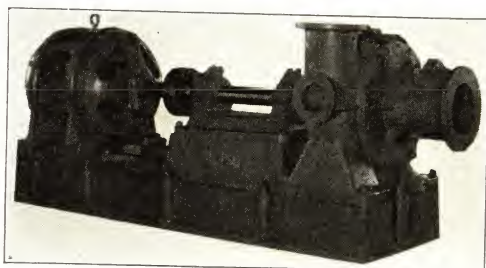
The sturdy mechanical design and high efficiency of these pumps make them particularly suitable for mill and power plant service. Precision methods in manufacturing and careful testing of each unit insures satisfactory performance. Complete sizes and details of construction are given in Bulletins.

## NON-CLOGGING CENTRIFUGAL PUMPS

Capacities up to 20,000 g.p.m. Heads up to 150 ft.

These pumps are made in both horizontal and vertical types. They are used for pumping raw sewage, industrial waste, paper pulp, etc., in sewage lift stations and in place of conveyors in industrial plants.

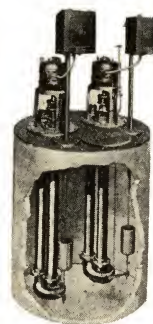
We are in position to furnish complete sewage and process pumping equipment, consisting of tanks, valves, fittings, piping, electric motors, automatic control, etc., all factory assembled.



Complete specifications and details of construction are contained in *Bulletins Nos. F 434, F 534.*

## SUMP PUMPS

Capacities, up to 5000 g.p.m. Heads up to 120 ft. Economy Sump Pumps and Sewage Ejectors are made in both clear water and non-clogging design. The non-clogging pumps handle sewage, rags, stones, etc., which are encountered in unscreened drainage. A number of interesting improvements have been made in these pumps to lengthen life and reduce maintenance cost. These features, together with complete capacity tables, are contained in *Bulletin No. 407* for clear seepage design, and *Bulletin No. 427* for the non-clogging design. The illustration shows a duplex pump. Single pumps are of the same design but mounted one in a basin.



Duplex Sump Pump

## SINKING PUMPS

Capacities up to 1000 g.p.m. Heads up to 300 ft. Designed for use in construction work wherever shafts must be sunk through wet soils or gravel. They will pass pebbles and similar material without breakage. Their shape is such that they fit between narrow ledges and into shafts of small diameter. The fact that Economy Sinking Pumps have been used, to the exclusion of all others, on many of the country's greatest construction projects, indicates the excellence of their design.

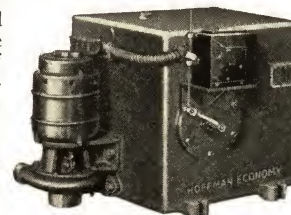
## AXIAL FLOW PUMPS

Capacities up to 30,000 g.p.m. at low heads. These pumps meet the need of efficient, low-priced apparatus for handling large volumes of water at low heads. They are used for drainage and sewage pumping, agitator service, irrigation, etc. They are designed for either horizontal or vertical settings for drive by electric motors, gasoline or oil engines, water turbines, etc. The simplicity of these pumps makes them ideal for many installations. They consist merely of an axial flow runner operating in a casing which also acts as suction and discharge pipe.

## CONDENSATION PUMPS AND RECEIVERS

Pumps and receivers are widely used to collect condensate, gland water drip, etc., and return it to the boiler or supply tank. The use of an electric pump and receiver instead of a steam pump makes it possible to reduce steam pressure during the night or inoperative period.

Complete description and list of sizes, both single and duplex, are given in *Bulletin No. 431.*

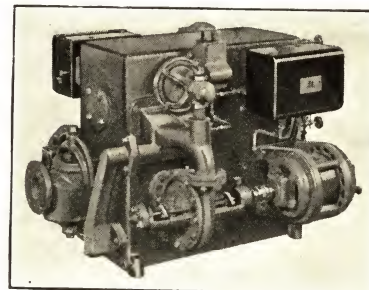


## RETURN LINE VACUUM PUMPS

These pumps are used to accelerate steam circulation on low pressure heating systems.

They provide for rapid removal of air from the system and insure the return of condensate to the boiler.

The Jet Type Vacuum Producer used in this pump is based on the simplest and best known method for exhausting air and vapors. The units are built in both single and duplex types, descriptions of which are given in *Bulletin No. 430.*



Return Line Vacuum Pump



# THE EDWARD VALVE & MANUFACTURING CO., INC.

EAST CHICAGO, IND.

Representatives in All Principal Cities

## PRODUCTS

Valves: Globe, Angle, Non-Return, Blow-off, Check, Drumhead, Atmospheric Relief, Bleeder Line Stop-Check, Gage, Straight Through, Relief, Back Pressure and special designs. Made with bodies and bonnets of forged or electric cast steel, carbon and alloy, semi-steel, and Ferac (high strength cast iron).



Trimmed with EValloy (stainless), EValnite (Nitalloy as processed by Edward), "18-8," Stellite, Monel, Bronze and other alloys. For pressures of 150 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature, also for hydraulic pressures up to 15,000 lb.

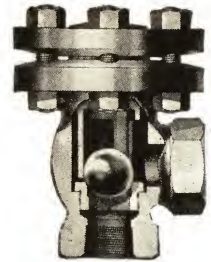


Fig. 2633

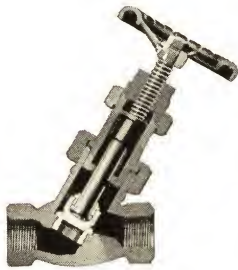


Fig. 2688

### GLOBE AND ANGLE STOP VALVES:

Figs. 2688 and 2828: Screwed end and flanged end forged steel globe valves. Seat and disk of EValloy or EValnite, stem of EValloy. Used extensively in steam power plants and oil refineries. Sizes  $\frac{1}{4}$  to 2 in.

Fig. 3518: Globe valve, one of the cast steel line of globe and angle valves. Body and bonnet of electric cast steel, carbon and alloy, with EValloy or EValnite trimmings. Larger sizes have EValthrust double combination radial and end thrust ball bearing yoke for easy operation. Sizes  $2\frac{1}{2}$  to 16 in.

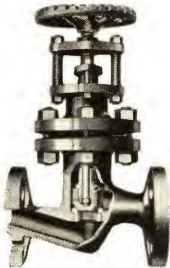


Fig. 2828

### NON-RETURN VALVES (Globe, Angle and Elbow):

Figs. 6305 and 3505: For 250 lb. and 1500 lb. working steam pressure, respectively. Other series for 400, 600 and 900 lb. Noiseless, easy of operation and maintenance, full area through all passages, slanting diaphragms, low pressure drop and Impactor (patented) handwheels on larger sizes for easy closing against boiler test pressures, are a few of the features of the Edward design in this essential boiler equipment. Sizes 2 to 16 in. for all pressures.

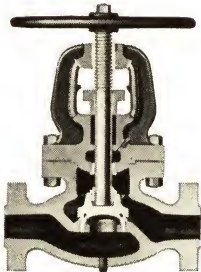


Fig. 3518

### BLOW-OFF VALVES (Globe, Angle and Straightway):

Edward blow-off valves are of the slow opening screw stem type particularly satisfactory for severe service in the higher pressure ranges. Usually installed in tandem. Made of forged steel, cast steel and Ferac metal, with EValloy stem, EValnite, EValloy or Stellite seat and disk, for working steam pressures of 250 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature. (Fig. 6841.)

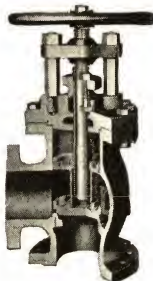


Fig. 6305

### CHECK VALVES:

"Piston Type," non-shock, tight seating, noiseless, disk cushioned throughout its travel. Ball Check in smaller sizes.

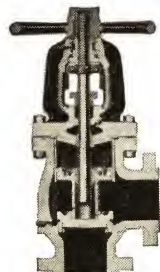


Fig. 3505

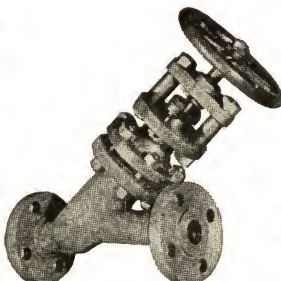


Fig. 6841



Fig. 141

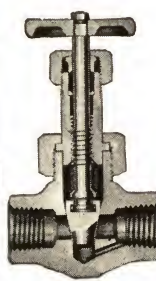


Fig. 150



Fig. 152

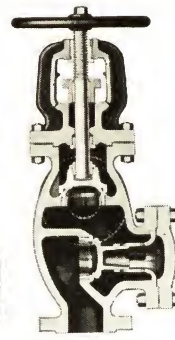


Fig. 2550

Made for working steam pressures of 250 lb. at 450° F. total temperature up to 2000 lb. at 1000° F. total temperature. (Figs. 2678, 3597 and 2633.)

### DRUMHEAD VALVES:

Figs. 2550 and 3548: Combination stop-check valves for feed line service. Elimination of a joint in combining stop valve and check valve in one body. Pressures 250 to 2000 lb., respectively.

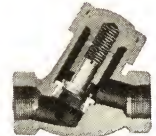


Fig. 2678

### ATMOSPHERIC RELIEF VALVES:

Fig. 293: Designed for either hydraulic or hand operation in two types—the turbine type without piston for small turbines, and the piston type for large turbines or reciprocating service. Positive and automatic opening. Full discharge capacity through all passages. Light weight disks which are fully guided throughout their travel. Sizes 6 to 48 in.

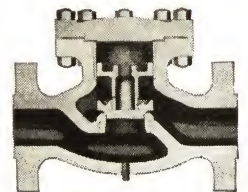


Fig. 3597

### STRAIGHT THROUGH VALVES:

Fig. 150: Small forged steel valves with straight line ports and truncated disk. For viscous fluids in refinery service and elsewhere. Used on sample lines, instrument connections, etc.

### GAGE VALVES:

Fig. 152: For instrument lines, good for high pressures. Regularly furnished with all parts of carbon steel, stainless steel or "18-8." Sizes  $\frac{1}{8}$  to 1 in.

### RELIEF VALVES:

Fig. 141: Forged steel, ball disk, relief valves to protect heat exchangers, etc., against excessive pressure. Furnished with adjusting screw and pressure tight cap for inflammable gases. Sizes  $\frac{1}{4}$  to 2 in.

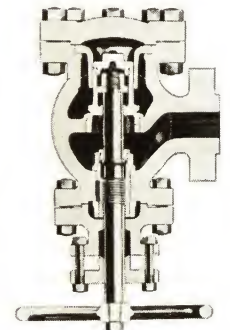


Fig. 3548

### BLEEDER LINE STOP-CHECK VALVES:

Noiseless, piston type, easy of operation and maintenance. Sizes 6 to 24 in.



Fig. 293



# ELLISON DRAFT GAGE COMPANY

214 WEST KINZIE ST., CHICAGO, ILL.

*Engineers and Manufacturers of Draft Gages*

## PRODUCTS

Ellison Draft Gages—tube and pointer types, Air Filter Gages, Saturator Gages, Liquid Level Gages, Pitot Tubes, Steam Calorimeters and Gas Analyzers. Designed by Lewis M. Ellison and manufactured by Ellison Draft Gage Company.



The Inclined Gage, open type, is for technical in-



## ELLISON POINTER DRAFT GAGES

**Straight-Line Movement:** This multi-pointer gage is made in from 1 to 20 readings with internal illumination and with vertical or tilted scales for surface or panel mounting, flush or semi-flush. It has a powerful movement repeating accurately at all points of the scale of uniform spacings. Fulcrum knife edges are of hardened steel and bell knife edge is of brass, enclosed with straps against displacement. Liquid used is a light petroleum oil,



kerosene for low temperatures, in a common pan with drain. Scale ranges are from .5 to 12", minus or plus, check sealed to any minus pressure, differential ranges from .8 to 10". For higher ranges or low drop-leg mercury is used.



**Dial Type:** This pointer gage, for minus, plus or differential, is of the same excellent construction and accuracy as the straight-line type using the same liquid and common pan and operates on three knife edge bearings with a powerful movement. It is made in 1, 2 and 3 pointers for surface or panel mounting.

Ellison Air Filter Gages for indicating the resistance through air filters are made in both the dial and inclined tube type.

## ELLISON TUBE DRAFT GAGES

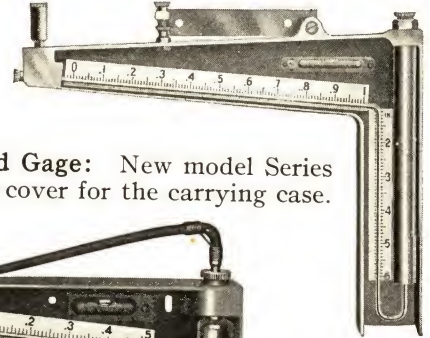


**Ellison Inclined Tube Gage:** Introduced in 1896, is the original inclined gage and is the recognized standard of accuracy, using red

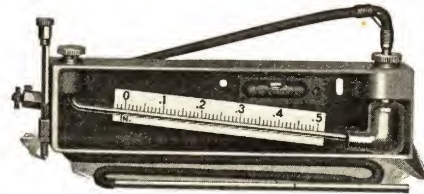
oil for the indicating liquid. It is of excellent design, construction and finish and is provided with sliding scale for zero setting and a fitting for cleaning the indicating tube. The cover type is for stationary use and is made in from .3 to 7½" range, 1 to 4 tubes, minus, plus or differential.

stitutions and power plant testing. Made in 1 to 5" range with differential system for high static.

**Inclined-Vertical Gage:** The low readings are multiplied on inclined tube, 1 to 5" range, then travel downward in the vertical portion up to 20" combined range, for plus, minus or differential.



**Portable Inclined Gage:** New model Series 35 with removable cover for the carrying case.



Made in from .5 to 2" range, with U gage in set for forced draft. Two-tube sets .5 to 1½" range.

**Ellison Vertical Gages, Cover Type:** Single tube gage is made up to 30" range, multi-tube up to 12 tubes and up to 20" range, minus, plus or differential, surface or panel mounting. Open type portable gages, single tube, up to 12" range.

## ELLISON PITOT TUBE

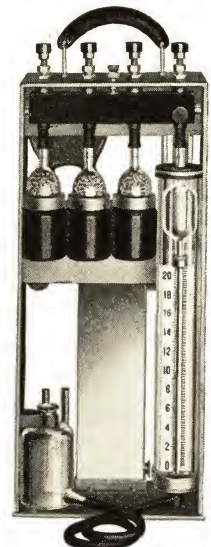
Is of excellent construction and is made in standard sizes up to 35", larger sizes to order.

## ELLISON PORTABLE GAS ANALYZER

In this new analyzer, a portable draft gage set and flue gas thermometer can be carried in the analyzer case, 4½ x 8 x 18", chromium plated. The header and needle valve points in the three-chamber analyzer are of hard rubber, corrosion-proof. In the single-chamber analyzer the stems are of Monel. Needle valves are used throughout, leak-proof, no grease. The stem has a swivel joint, no turning in the seat.

Scale is of white celluloid, 7 to 8" long, readings visible several feet. Jacket is filled with glycerine, keeping surfaces clean, no freezing.

Solution containers are of hard rubber, low head. For the gas absorption, the chambers are filled with curled hard rubber which holds a large quantity of solution, is light in weight, and neither rusts nor scratches the glass surfaces.





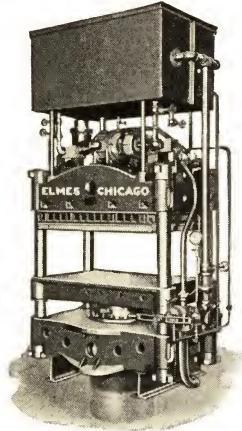
## CHARLES F. ELMES ENGRG. WORKS

215 NORTH MORGAN STREET, CHICAGO, ILL.

Established 1851 Telephone: Haymarket 0696 Incorporated 1895  
Hydraulic and Special Machinery, Presses, Pumps, Accumulators,  
Valves, etc.

### 400 TON PRESS NO. 3924:

No. 3924. A 400 ton press for flat or very deep embossing. Featured by high volume low-pressure and concentrated high-pressure power, the several operations of starting, stopping, handling and controlling both the press movement and the material in and out of the press are accomplished by instantaneous single lever, semi-automatic or full automatic control.

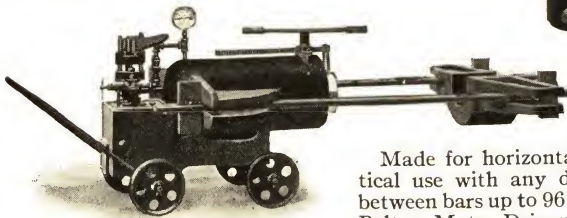


No. 3924

### PORTABLE JACKS AND FORCING PRESSES:

From 10 to 1000 tons capacity.

The variety of their usefulness is unlimited; utilized in pump, pits, mine shafts, shipholds, power stations, machine shops, engine works, motor works, locomotive works, etc.



No. 2297



No. 371

Made for horizontal or vertical use with any dimension between bars up to 96". Hand, Belt or Motor Driven and Hydraulic Ram Return as desired.

### LABORATORY TESTING PRESSES:

No. 3429-X is for maximum pressures of 12 and 18 tons. The platens are 8" square with 16" vertical opening.

The press is shown equipped for molding tests with 6" square Hot Plates, Insulated Mats between plates and press heads, Industrial Type Thermometer and 3 Heat Switch to operate from electric light socket.

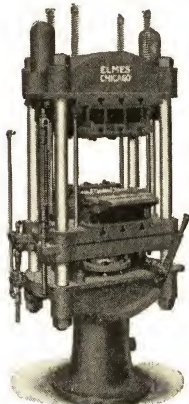
Moderately priced. Shipments from stock.



No. 3429-X

### PLASTIC MOULDING EQUIPMENT:

No. 2693 is Semi-Automatic, the knockouts are returned without handling valves or moving press ram. The maximum clearance permits reseating knockouts and die buttons without loss of time.

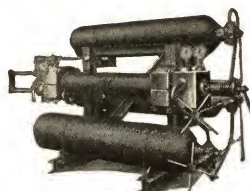


No. 2693

### HYDRAULIC ACCUMULATORS:

Gravity and Compressed Air Types:

The use of the Compressed Air Accumulator (No. 3014) dispenses with excavations, foundations and ballast material. Floor space and headroom are minimized. They eliminate line shocks and other objectionable features.



No. 3014

## EVERLASTING VALVE COMPANY

49-65 FISK STREET, JERSEY CITY, N. J.

Manufacturers of Valves for Boiler Blow-off and Many Other  
Uses for Steam, Water, Air, Oil, Tar, Gas, Gasoline,  
Acids, Locomotive and Marine Service

Agents in All Principal Cities

### PRODUCTS:

**For Boiler Room:** Everlasting Blow-off Valves, Everlasting's Companion Angle, Everlasting Duplex Blow-off Unit, Everlasting Special Water Column and Drain Valves, Everlasting Model X Tandem Valve.

**For Process and General Work:** Regular Everlasting Quick Opening and Closing Straight Through Gate Valve, Flatplug Valve in Straight-Line and Angle types, Everlasting Tender Tank Valve, Everlasting Valve Weight Operated with Pendulum Stop for Fire Protection.

### EVERLASTING VALVES:

Regular Everlasting Valves are especially designed for Boiler Service, blowdown or drain on Water Columns, Water Glasses, branch lines of Superheater Units, etc. Straight through uninterrupted passage. Disc held to Seat by New Patented Spring and Pressure. Seating Surfaces take on a glaze that keeps them tight. *Metal-to-metal seal. High and low pressure.*

The Straight Lever Type is a quarter turn valve and is for quick opening and quick closing. The Rack and Pinion type is a half-turn valve and is for slower and easier operation. Everlasting Valves are made of cast iron, cast steel, bronze and acid resisting metal in sizes  $\frac{1}{4}$  in. to 16 in.

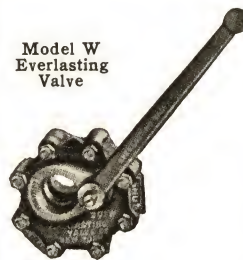
Note the power in the Eccentric Rack and Pinion in *Everlasting Valve Special*, bringing to bear the greatest leverage where needed—at opening and closing of the valve. Easy to operate.

### EVERLASTING DUPLEX BLOW-OFF UNIT:

*Everlasting Duplex Blow-off Unit* consists of an Everlasting Valve as the *Seal or Holding Valve*, and Everlasting Companion Angle Valve as the *Operating or Blowing Valve*. The Everlasting Valve can be either Straight Lever type or Rack and Pinion. For higher pressure the Rack and Pinion permits of slower and easier operation.

Everlasting Valves are used by the principal Industrials, Railroads, Oil Companies, Chemical Companies and others, not only in the United States, but all over the World for Boiler Blow-off and 1001 other uses where a dependable leak-tight valve is desired.

Write for illustrated bulletins.



Model W  
Everlasting  
Valve



Everlasting Valve Special  
for 600 Lbs. Pressure



Everlasting Special Duplex  
Blow-off Unit for 600 Lbs.  
Pressure





# FAIRBANKS, MORSE & CO.

GENERAL OFFICES  
900 So. WABASH AVENUE, CHICAGO, ILL.

*Manufacturers of Engines, Electrical Machinery Pumps, and Scales*

ATLANTA, GA.	CINCINNATI, OHIO	DETROIT, MICH.	LOUISVILLE, KY.	NEW YORK, N. Y.	ST. LOUIS, MO.
BALTIMORE, MD.	CLEVELAND, OHIO	INDIANAPOLIS, IND.	MEMPHIS, TENN.	OMAHA, NEBR.	ST. PAUL, MINN.
BIRMINGHAM, ALA.	DALLAS, TEXAS	JACKSONVILLE, FLA.	MILWAUKEE, WIS.	PHILADELPHIA, PA.	SALT LAKE CITY, UTAH
BOSTON, MASS.	DENVER, COLO.	KANSAS CITY, MO.	MINNEAPOLIS, MINN.	PITTSBURGH, PA.	SAN FRANCISCO, CAL.
BUFFALO, N. Y.	DES MOINES, IOWA	LOS ANGELES, CAL.	NEW ORLEANS, LA.	PORTLAND, ORE.	SEATTLE, WASH.
CHICAGO, ILL.				PROVIDENCE, R. I.	STUTTGART, ARK.

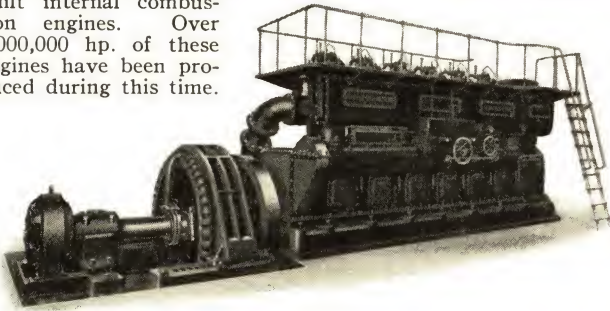
Branches throughout the World

## PRODUCTS AND SERVICE:

Fairbanks, Morse & Co. manufactures Complete Equipment for the Generation of Electric Power, Electric Motors for driving various industrial machines, Pumps to meet all pumping requirements, and Scales of all types.

## DIESEL ENGINES:

For more than 40 years Fairbanks, Morse & Co. has designed and built internal combustion engines. Over 4,000,000 hp. of these engines have been produced during this time.



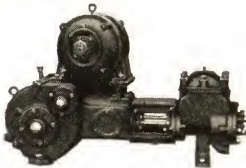
1050-Hp. Diesel Engine with Direct-Connected Alternator and Exciter

Diesel engines will reduce your power costs to a minimum. The over-all economy of these engines resulting from the efficient burning of low-grade fuel and from extreme simplicity in construction and operation has, in most instances, paid for the original investment in a few years.

Fairbanks-Morse Diesel power units are available for direct connection to loads or with built-in generators. Sizes 8 to 3300 hp.

## PUMPING EQUIPMENT:

Fairbanks, Morse & Co. manufactures a complete line of centrifugal, steam, and power pumps for all classes of service, including ball bearing, single stage and multistage pumps, and enclosed reciprocating pumps, stock, sewage and trash pumps, screw pumps and turbine pumps.



Enclosed End Self-Oiling Duplex Power Pump



Ball Bearing Single Stage Centrifugal Pump

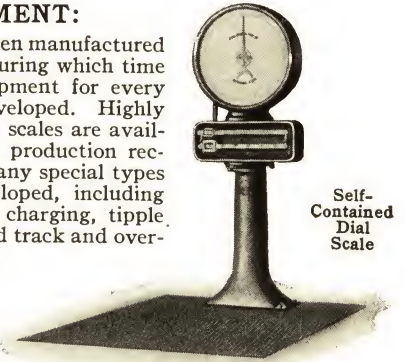
### PRINCIPAL TYPES OF CENTRIFUGAL PUMPS

Fig. Nos.	Sizes, In.	Capacities, G. P. M.	Max. Heads, Ft.	Suction	Im-peller	Bear-ings	Cas-ing
		Min.—Max.					
5510	1—8	20—2,200	100	Side	Open	Sleeve	Solid
5520	1—8	20—2,300	100	Side	Closed	Ball	Solid
5530	1—4	20—1,000	125	Side	Closed	Ball	Solid
5560	8—18	900—10,000	100	Side	Closed	Sleeve	Solid
5810	2—8	250—3,000	280	Double	Closed	Ball	Split
5840	12—42	3000—65,000	200	Double	Closed	Sleeve	Split
5870	1½—4	90—600	220	Double	Closed	Ball	Split
5950	2—6	100—1,500	500	Side	Closed	Sleeve	Split
Sewage and Trash Pumps							
5410	2—20	80—28,000	100	Bottom	Closed	Ball	Vertical
5420	2—20	80—28,000	100	Side	Closed	Ball	Horiz.
Turbine Pumps							
6920	4—16	50—2,200	450	Bottom	Closed	Sleeve	.....
6950	6, 8, 10	20—1,100	450	Bottom	Open	Sleeve	.....

## WEIGHING EQUIPMENT:

Fairbanks Scales have been manufactured for more than 100 years, during which time dependable weighing equipment for every industrial need has been developed. Highly efficient direct-reading dial scales are available for securing accurate production records at small expense. Many special types of scales have been developed, including mechanical recording, car charging, tippie and hopper scales, overhead track and overhead suspension scales, crane scales, etc.

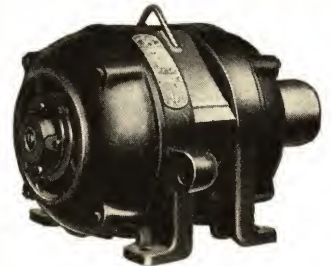
For weighing in larger quantities, Fairbanks railroad track scales, auto truck and wagon scales give the same order of efficient service and sustained accuracy with negligible upkeep cost. Accurate control of every production step can be maintained by the use of Fairbanks Scales because they are available in a range of sizes and capacities to meet all needs.



Self-Contained Dial Scale

## ELECTRICAL EQUIPMENT:

Fairbanks, Morse & Co. has developed a complete line of general purpose and special motors for application to all kinds of machinery. Ball bearing motors—pioneered and developed by Fairbanks-Morse—are especially advantageous for all difficult drives where dependability is essential, such as driving ventilating fans, pit and mine pumps, air compressors, conveying equipment, etc. Bearings are sealed to keep out the dirt and keep the grease in; they require lubrication only once a year.



Type QC Enclosed Fan Cooled Motor

### PRINCIPAL TYPES OF FAIRBANKS-MORSE MOTORS

Horsepower Range	Synchronous Speeds	Frequencies	Standard Voltages
Type DH Ball Bearing Direct-Current Motors, Shunt or Compound, with Commutating Poles			
¼—60	575, 850, 1150, 1750	..	115, 230
Type Q Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Normal Starting Current, Constant Speed			
½—75	900, 1200, 1800	60	220, 440, 550, 2200
Type QS Line Start Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Low Starting Current, Constant Speed			
½—30	900, 1200, 1800	60	220, 440, 550, 2200
Type QC Enclosed Fan Cooled Squirrel Cage Induction Motors with Sealed Ball Bearings, Normal Torque, Normal Starting Current, Constant Speed			
½—75	900, 1200, 1800	60	220, 440, 550, 2200
Type H Ball Bearings Squirrel Cage Induction Motors, Normal Torque, Normal Starting Current, Constant Speed			
¼—1200	400, 450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800, 3600	25 or 60	110, 220, 440, 550, 2200
Type B Sleeve Bearing Squirrel Cage Induction Motors, Normal Torque, Normal Starting Current, Constant Speed			
¼—1200	400, 450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800	60	110, 220, 440, 550, 2200
Type HV Ball Bearing Wound Rotor Induction Motor, High Torque, Low Starting Current, Variable Speed			
¾—200	400, 450, 514, 600, 720, 750, 900, 1200, 1800	25 or 60	110, 220, 440, 550, 2200
Synchronous Motors, Ball or Spherical Bearings			
20—10,000	450, 500, 514, 600, 720, 750, 900, 1200, 1500, 1800	25 or 60	220, 440, 550, 2200



# FARREL-BIRMINGHAM COMPANY, INC.

Successor to FARREL FOUNDRY & MACHINE CO. (Est. 1848) and BIRMINGHAM IRON FOUNDRY (Est. 1836)

MAIN AND STATE STREETS, ANSONIA, CONN.

PLANTS at ANSONIA and DERBY, CONN., BUFFALO, N. Y.

## SALES OFFICES AND REPRESENTATIVES

AKRON, OHIO . . . . . 2710 First Central Trust Bldg.  
CHICAGO, ILL. . . . . 1059 First Natl. Bank Bldg.  
NEW YORK, N. Y. . . . . 79 Wall St.  
BUFFALO, N. Y. . . . . 348 Vulcan St.  
NEWARK, N. J. . . . . Evarts G. Loomis, 126 So. 14th St.  
HACKENSACK, N. J. . . . . D. A. Comes, 210 Poplar Ave.  
SAN FRANCISCO, CAL. . . . . George L. Hurst, 785 Market St.  
PITTSBURGH, PA. . . . . J. P. Flippen, 503 Oliver Bldg.

LOS ANGELES, CAL. . . . . H. F. Parkerton, 1506 Santa Fe Ave.  
HAVANA, CUBA . . . . . Frank L. Allen, Inc., Aguiar 73  
SAN JUAN, PORTO RICO . . . . . Enrique Abarca  
BUENOS AIRES, ARGENTINE . . . . . John-Manville Boley, Ltda., Alsina 743  
PERNAMBUCO, BRAZIL . . . . . Ayres & Son, Rua D. Maria Cezar 31/41  
MANILA, PHILIPPINE ISLANDS . . . . . Edward J. Nell Co., 680 Dasmariñas  
STOCKHOLM, SWEDEN . . . . . Enger Hellesen & Co., Malmstorgsgatan 3  
BEAUCHAMPS (S & O), FRANCE . . . . . Maurice Ledran 8, Ave. de la Chasse

## PRODUCTS:

**Metal Working Machinery:** Rolls, Rolling Mills, Roller Tables, Blockers, Coilers, etc.—Roll Grinders, Roll Calipers—Gears, Heavy Transmission Machinery, Balance Wheels, etc.—Hydraulic Presses, Accumulators—Power Presses, Press-Brakes, Shears—Blast Gates—Special Machinery—Castings.

**Rubber and Plastics Machinery:** Milling, Mixing and Kneading Machines, Banbury Internal Mixers or Masticators for laboratory and factory, Calenders, Mills, Refiners, Washers, Crackers, Tubing Machines, Plasticators, Hydraulic Presses, etc.

**Paper Mill Machinery:** Paper and Board Calenders—Chilled and Alloy Iron Rolls for Various Purposes—Roll Grinders, Roll Calipers—Calender Roll Recovering Presses.

## ROLLING MILLS:

With improved features of design that bring about more satisfactory operating conditions, increased output, lower power consumption, minimum labor and maintenance costs and notably superior accuracy and precision.

Figure 1 shows a Farrel Rolling Mill of a type designed for rolling sheets, strips or rods, equipped with anti-friction bearings throughout, universal joints, pinion unit contained in a single housing, Farrel-Sykes double helical mill pinions and reduction gears and other features that provide unusual efficiency, smoothness of operation and economy of floor space.

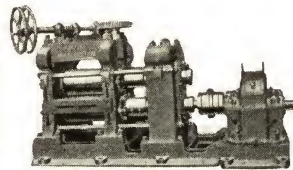


Fig. 1

Figure 2 shows two-high and three-high breaking-down stands, part of an eleven-stand complete Mill for rolling copper rods. With five intermediate and four finishing stands the complete Mill has a capacity of 150 tons of  $\frac{1}{4}$ " round copper rod per ten-hour day or 200 tons of  $\frac{5}{16}$ " and  $\frac{3}{8}$ " rods. Design leads to exceptional operating advantages and economies.

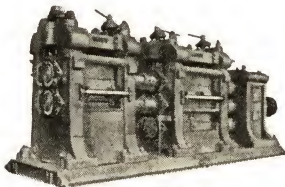


Fig. 2

## HEAVY DUTY ROLL GRINDERS:

For grinding all types of metal working rolls. Designed for better, faster and cheaper grinding to the extreme limits of accuracy required by modern industry.

Figure 3 shows a 60" x 20' 0" machine. Sizes to handle rolls up to maximum diameters of 28", 36", 44", 52" and 60", and lengths from 8' 0" to 26' 0" between centers.

Individual motor drive for each unit with centralized control at operator's station. Crowning device produces mathematically correct crown or concavity—very easily and quickly set. Smooth, vibrationless work drive through multiple V-belt driven headstock. Improved spindle and wheel head design. Carriage driven by reversing motor through cut double helical gears and worm and rack. Inverted V type ways, flood lubricated. Dead centers in both headstock and footstock. Heavy, rugged construction imparts stability. Combination of all features assures high quality of work with maximum production.

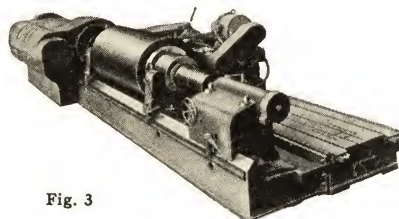


Fig. 3

## RAFTER PRESS-BRAKE (Patented):

The Rafter Press-Brake employs a new and unique principle of design which leads directly to increased output at lower cost.

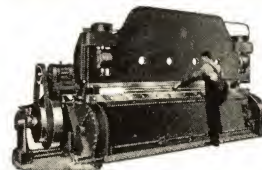


Fig. 4

All overhead driving mechanism is eliminated. With the drive in the base of the machine, overall height is lowered and less head room is necessary. At the same time the ram and bed are made exceptionally deep, with weight and strength concentrated where it is effective in resisting deflection and producing work of highest accuracy.

A full range of sizes is available. Figure 4 is a front view of the No. 10-10, of 100 tons maximum capacity, 10' 6" clear space between connecting links, 12' 8" die space.

## HYDRAULIC PRESSES:

For a wide variety of purposes, including flanging, bending, straightening and forming of metals—molding and vulcanizing rubber and plastics—Tiling, Matting, Linoleum and Belt Presses—Celluloid Polishing Presses—Calender Roll Recovering Presses, etc.

Figure 5 shows a 1500-ton, Hydraulic Flanging Press, only one example of a large range of types and sizes.

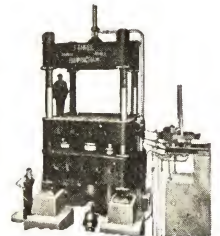


Fig. 5

## BANBURY MIXER (Patented):

For working rubber and other heavy plastics—mixing and compounding with filling powders, masticating, massing, blending, grinding, disintegrating, etc. Used extensively in the production of all rubber goods, asphaltic materials, asphalt floor tiling, linoleum, roofing materials, phenolic condensation products (including bakelite), resinous compounds, paints, enamels, lacquers, etc.

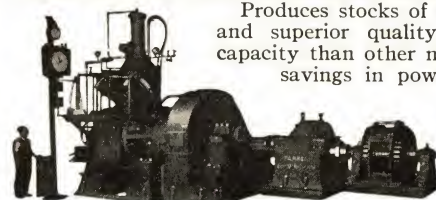


Fig. 6

Produces stocks of exceptional uniformity and superior quality. Greater productive capacity than other methods. Effects large savings in power, labor, floor space, material handling and compounding costs, usually sufficient to pay for an installation in a year or less. Seven sizes from midget  $\frac{3}{4}$ -pound batch to 1000-pound batch in No. 27. Figure 6 shows size 11 with approximate batch capacity of 450 pounds.

Performance records, list of installations and complete details on request. Machine available for tests on special materials.

## PAPER MILL MACHINERY:

**Rolls:** Chilled and Alloy Iron for Paper, Board, Glassine and Super Calenders, Breaker Stacks, Smoothing Presses, etc.

**Calenders:** Board Calenders of any size. Paper Finishing Calender Stacks in all sizes up to 312" face, equipped with electric, hydraulic or ratchet lift, all operated from the floor. Fig. 7 shows a 9-roll stack, 208" face, with electric lift.

**Farrel Two-Wheel Roll Grinders:** Embody unique features of design which make possible extremely close limits of precision, high quality of finish and at the same time promote efficiency of grinding and reduce maintenance costs.

**Farrel Indicating Calipers:** Show slightest variation in diameter of roll at any point in its length and measure exact amount of crown.



Fig. 7



# FARREL-BIRMINGHAM COMPANY, Inc.

Successor to FARREL FOUNDRY & MACHINE CO. (Est. 1848) and BIRMINGHAM IRON FOUNDRY (Est. 1836)

348 VULCAN ST., BUFFALO, N. Y.

PLANTS at ANSONIA and DERBY, CONN., BUFFALO, N. Y.

*Manufacturers of Gears, Gear Units, Gear Generators and Flexible Couplings*

## FARREL-SYKES GEARS:

Farrel-Sykes continuous tooth herringbone gears, staggered-tooth herringbone gears, single helical gears and straight spur gears are precision gears, generated on Sykes Gear Machines which operate on a theoretically correct principle and by the process of generation all errors in the teeth are avoided. The same standard of accuracy applies throughout the entire size range.

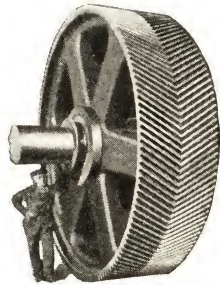


Fig. 2

Farrel-Sykes continuous tooth herringbone gears have from 20% to 40% more bearing surface and 60% greater strength. Sizes range from  $\frac{1}{4}$ " to 20' 0" diameter,  $\frac{1}{4}$ " to 54" face, 24 D.P. to  $\frac{3}{4}$  D.P.

Spur Gears from  $\frac{1}{4}$ " to 20' 0" diameter,  $\frac{1}{4}$ " to 30" face, 24 D.P. to  $4\frac{1}{2}$ " C.P.

Internal Gears, spur or helical, any size up to 18' 0" diameter, 15" face, 4" C.P.



Fig. 3

## FARREL-SYKES HERRINGBONE PUMP ROTORS:

Around their use for many years has been developed a wide experience and technique in application. Suitable for high pumping pressures. Larger volumetric efficiency, far smoother operation and higher speeds than spurs. Sizes range from the very smallest up to diameters as large as 12", face widths as large as 18" and pitches as coarse as  $\frac{3}{4}$  D.P. They include not only special tooth proportions but also special tooth contours which have been developed especially for this service.

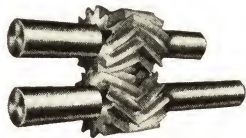


Fig. 4

## SYKES GEAR GENERATORS:

The principle of gear cutting employed in the Sykes Gear Generator and the basic simplicity of the entire mechanism assure fast, accurate and economical production of gears of all types that operate on parallel axes.

Besides the well known Farrel-Sykes continuous tooth herringbone gear, Sykes Gear Generators will generate spur gears, single helical gears, internal gears, cluster gears simultaneously, and double helical gears with a center groove (teeth matched or staggered—with helices of similar pitch or dissimilar pitch).

They are made in seven sizes to cut gears of the following diameters:

Size No.	Minimum	Maximum
1-A	$\frac{3}{4}$ "	12"
2-A	$1\frac{1}{2}$ "	25"
4-A	1"	49"
5-A	1"	61"
10-A	$3\frac{3}{4}$ "	120"
12	$8\frac{1}{2}$ "	240"
12-G	3"	264"

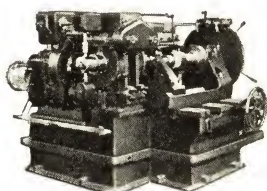


Fig. 5



Fig. 1  
"The Gear with  
a Backbone"

## FARREL-SYKES SPEED REDUCERS:

We have developed a complete line of totally enclosed, self-contained reduction units to accommodate anything from fractional horse-powers up to motors of 10,000 H.P. rating. The ratios available range from 1/1 to 300/1 and the designs

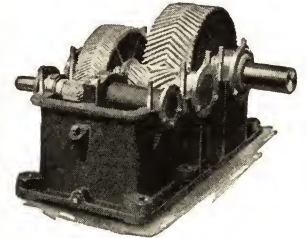


Fig. 6

include single, double and triple reduction units as well as drives to suit special requirements and change speed units having two or more selective speeds.

## HIGH SPEED AND SPEED INCREASING UNITS:

This series of gear units has been especially designed for high speed and turbine application and for speed increasing work, such as connecting Diesel engines, gas engines, steam turbines or other prime movers to centrifugal pumps or other machinery which runs at a higher speed than the driving engine. They have been standardized in a series of units suitable for speeds up to 8500 R.P.M. and powers from 50 H.P. to 2500 H.P., with ratios up to 12/1.

In design these units differ considerably from speed reducers and the extension of speed increasing applications is due entirely to the development of units that are efficient, reliable and durable, and will function without trouble for a long period of time.

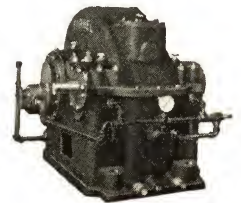


Fig. 7

## HEAVY DUTY DRIVES:

Engineering experience and manufacturing facilities equip us to build single, double and triple reduction gear units for heavy duty service and for either high or low speeds. We have a standard heavy duty series of single and double reduction drives; also a large collection of special designs from which we can draw or which can form the basis of new designs as required. All of our standard units are fitted with Farrel-Sykes herringbone gears and with babbit-lined or anti-friction bearings as desired. The housings likewise are made in tough, close-grained cast iron or cast steel.

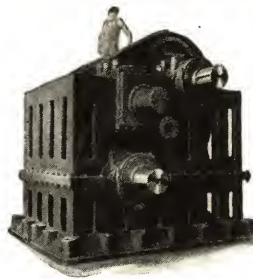


Fig. 8

## FLEXIBLE COUPLINGS:

Farrel "Gearflex" Couplings are all-metal flexible couplings of the gear type—self-contained, dust and moisture proof, positively lubricated and, due to the design, inherently accurate in construction. They will transmit power at high or low speeds, or in reverse, with equal efficiency and dependability.

They are made in both double and single engagement types, each in a range of 16 sizes from  $2\frac{1}{2}$ " to 20".

In addition to the standard line we manufacture special designs of flexible couplings fitted with shear pins or torsional resilient members or other features as desired.

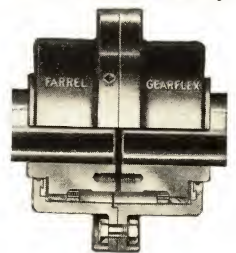


Fig. 9



# THE FALK CORPORATION

## MILWAUKEE, WISCONSIN

### DISTRICT OFFICES AND REPRESENTATIVES

AKRON, OHIO . . . . . 682 W. Market Street  
ALBANY, N. Y. . . . . 82 State Street  
ATLANTA, GA. . . . . 1000 Peachtree St., N. E.  
BALTIMORE, MD. . . . . 1620 E. 32nd Street  
BIRMINGHAM, ALA. . . . . General Machinery Co.  
BOSTON, MASS. . . . . 60 Batterymarch Street  
BUFFALO, N. Y. . . . . Root, Neal & Co.  
BUTTE, MONT. . . . . Montana Hardware Co.  
CHARLESTON, W. VA. . . . . W. J. Hess  
CHICAGO, ILL. . . . . 122 S. Michigan Avenue  
CINCINNATI, OHIO. . . . . 3861 Meyerfeld Avenue  
CLEVELAND, OHIO . . . . . 1836 Euclid Avenue  
DALLAS, TEXAS . . . . . 412 Continental Building  
DENVER, COLO. . . . . Mine & Smelter Sup. Co.  
DETROIT, MICH. . . . . 604 Kerr Building  
EL PASO, TEXAS . . . . . Mine & Smelter Supply Co.

HOUSTON, TEXAS . . . . . 1901 Caroline Street  
KALAMAZOO, MICH. . . . . 602 Hanselman Building  
KANSAS CITY, MO. . . . . 2948 E. 30th Street  
LOS ANGELES, CAL. . . . . 931 Rowan Building  
LOUISVILLE, KY. . . . . Ray Buckley  
MARQUETTE, MICH. . . . . Lake Shore Engine Works  
MINNEAPOLIS, MINN. . . . . 708 Sixth Avenue, South  
NEWAYGO, MICH. . . . . W. H. Slaughter  
NEW ORLEANS, LA. . . . . Robbins & Robbins  
NEW YORK, N. Y. . . . . 50 Church Street  
OKLAHOMA CITY, OKLA. . . . . C. F. Dagwell  
OMAHA, NEBR. . . . . Pasol Engineering Co.  
PEORIA, ILL. . . . . Hagerty Bros. Co.  
PHILADELPHIA, PA. . . . . 2401 Chestnut Street  
PITTSBURGH, PA. . . . . 1631 Grant Building  
RICHMOND, VA. . . . . T. Spencer Williamson, Jr.

ROCHESTER, N. Y. . . . . 312 Terminal Building  
SALT LAKE CITY, UTAH, Mine & Smelter Supply Co.  
SAN FRANCISCO, CAL. . . . . S. O. Otrich Co.  
SEATTLE, WASH. . . . . 1 West Lander Street  
SPOKANE, WASH. . . . . General Machinery Co.  
ST. LOUIS, MO. . . . . 5475 Cabanne Ave.  
SYRACUSE, N. Y. . . . . J. B. Foley, Jr.  
TAMPA, FLORIDA . . . . . Tampa Armature Works  
TULSA, OKLA. . . . . Petroleum Eng. & Equip. Co.  
WALLACE, IDAHO, Coeur D'Alene Hdw. & Fdy. Co.  
WAUSAU, WIS. . . . . D. J. Murray Mfg. Co.  
WILKES-BARRE, PA. . . . . Vulcan Iron Works  
WORCESTER, MASS. . . . . L. W. Rawson  
YOUNGSTOWN, OHIO . . . . . Frank J. Bowers, Inc.

CANADA—William Kennedy & Sons, OWEN SOUND, ONTARIO—Branches: HALIFAX, MONTREAL, TORONTO, NEW LISKEARD, VANCOUVER

MEXICO—George Spence—Gante No. 8—MEXICO, D. F.

PHILIPPINE ISLANDS—Earnshaw Docks & Honolulu Iron Works Co.—MANILA

HAWAII—Honolulu Iron Works Co.—HONOLULU

CUBA—Distribidores, S. A. Obispo 79—HABANA

SOUTH AFRICA—Ed. L. Bateman (Pty.) Ltd.—JOHANNESBURG, TRANSVAAL

### FALK HERRINGBONE GEARS

Falk Herringbone Gears, with staggered and continuous teeth, cover the entire range of gear requirements. Any diameter from 1 in. to 16 ft.; any face from 1 in. to 6 ft.; any pitch from

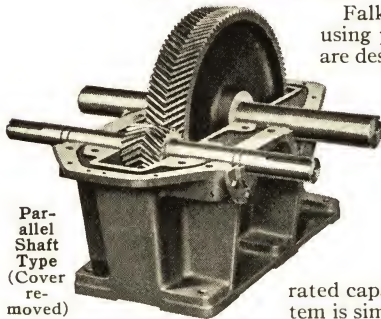
25 to  $\frac{3}{4}$  diametral pitch. Speeds up to 16,000 ft. per min. Falk Herringbone and Single Helical Gears have been known for many years throughout industry for long, quiet life and high efficiency.

### FALK SPEED REDUCERS

Standardization, All Falk Reducers: 17 types—202 sizes, from 1000 hp. down to 0.05 hp.—242 standard ratios from 1.5:1 to 518:1—144 motor bed sizes—are carried in stock for quick

shipment. The Falk staff of engineers will co-operate with you in adapting efficient Falk Drives to your power transmission requirements.

#### Parallel Shaft Speed Reducers

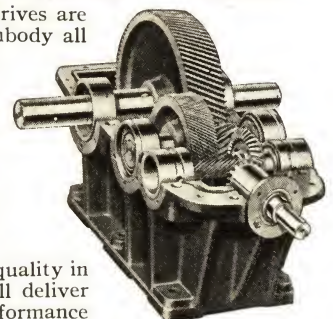


Parallel Shaft Type (Cover removed)

Falk Parallel Shaft Reducers, using precision herringbone gears, are designed so that each unit shall transmit safely its full rated capacity under continuous operation with 100% reserve for momentary overloads in starting or during operation. The result is absolute reliability for continuous duty, and reserve for actual punishment beyond rated capacity. The lubrication system is simple and self-contained—oil-tight housings are a feature.

#### Right Angle (Horizontal Type) Speed Reducers

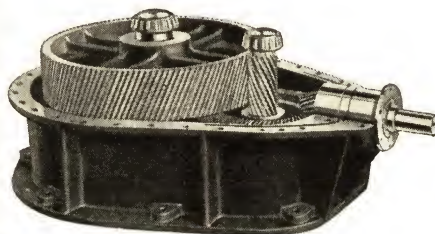
The new Falk Right Angle Drives are distinctly Falk in design and embody all the proved Falk principles of good engineering. This unit is highly practical where space conditions prohibit anything but a gear drive having low and high speed shafts at right angles. Under such conditions the Falk Right Angle Drive is preferred to a worm drive because of Falk ruggedness, efficiency and cool operation. It is of typical Falk quality in every sense of the word and will deliver the same quiet, trouble-free performance for which Falk Parallel Shaft Reducers are noted.



Right Angle, Horizontal Type (Cover removed)

#### Right Angle (Vertical Type) Speed Reducers

Included in the line of Falk Right Angle Speed Reducers is the vertical type shown at the right. This reducer includes precision single helical and spiral bevel gears and embodies the same high qualities of design and materials for which Falk is so widely known and accepted.



Right Angle, Vertical Type (Cover removed)

#### Falk Motoreducers

Falk Motoreducers (combined motor and speed reducer) are made in three styles—Integral, Flexible and All-Motor, in both Horizontal and Vertical types; in sizes from  $\frac{3}{4}$  to 75 H.P., for speeds of 580 to 1750 R.P.M. and speeds of driven shaft from 2 to 4000 R.P.M.

The All-Motor type allows the use of any standard stock motor, without change, and gives compactness, economy, pleasing appearance and a straight line drive.

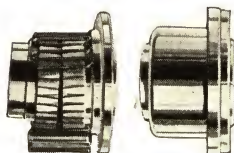


Helical-Geared Motoreducer All-Motor Type

### FALK COUPLINGS

#### Falk Flexible Couplings

A design for every purpose and speed. This coupling protects both the motor and the driven machine and insures immunity from shut-down through its unique shock-absorbing qualities. Range,  $\frac{1}{2}$  to 18,000 hp. at 100 r.p.m.

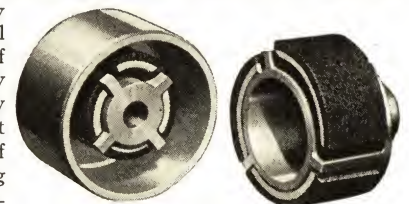


Falk Flexible Coupling (Cover removed)

**Special Advantages:** (1) Absorb shock and vibration. (2) Allow both lateral and torsional elasticity. (3) Float freely under load. (4) Easily connected and disconnected. (5) All steel. (6) Perfectly lubricated. (7) Cannot rust. (8) Operate equally well in both directions. (9) Accommodate both parallel and angular misalignment.

#### Falk-Rawson 4-Duty Couplings

The Falk-Rawson Coupling performs four important duties—starts, couples, cushions and limits the load. It makes possible an important saving in electrical equipment—protects the machine or product being made by affording smooth, gradual starting and cushioning of overloads. It frequently cuts the electrical bill by reducing inrush current and allowing selection of smaller motors operating closer to maximum capacity. Write for bulletin.



Falk-Rawson 4-Duty Coupling



## THE FLEMING STRUCTURAL STEEL CO.

NEW CASTLE, PA.

*Engineers and Fabricators  
of Riveted and Welded Steel Structures*

### FABRICATED STRUCTURAL STEEL

#### Riveted or Welded

For over 40 years we have been continuously at work fabricating steel construction. During that time we have enjoyed the complete confidence of many nationally known concerns. We have shipped steel to all parts of the United States and abroad. To a great many of our customers we have been a branch factory, taking care of their requirements as would their own plant.

We are old in experience but modern in equipment and organization.

We are a small concern who can give the personal touch and interest in your work, whether small or large.



The fabrication of structural steel is our only business. We have no specialties to sell and we are not looking for any. Your work will be treated with the greatest confidence.

Sound engineering, accuracy and first class workmanship have made and kept for us satisfied customers year after year.

We shall be glad to quote you on any part of your product that is made of steel shapes and plates, riveted or welded. We will ship it for you anywhere just as if we were a part of your organization.

Mechanical Catalog (1934-35)

## FLEXO SUPPLY COMPANY

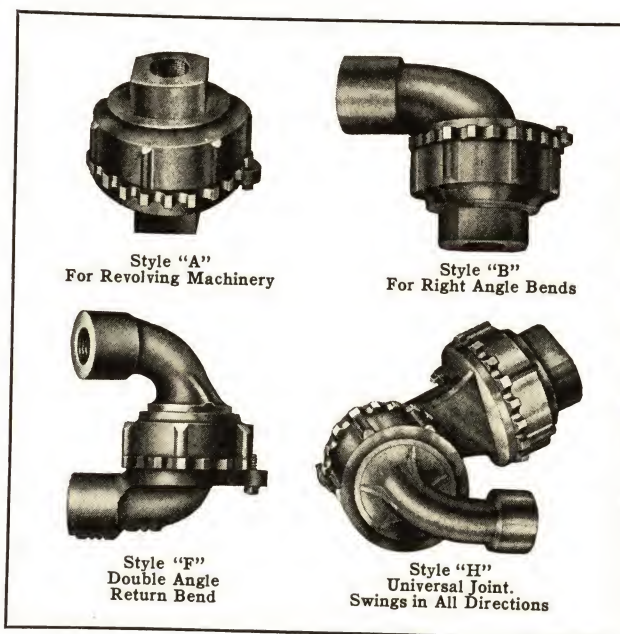
4219 OLIVE STREET, ST. LOUIS, MO.

*Manufacturers of Flexo Joints*



FLEXO JOINTS are used wherever a flexible or swing pipe joint is required for conveying steam, compressed air, water, oil, gasoline and other fluids. Made in 4 styles (illustrated below) and in all standard iron pipe sizes from  $\frac{1}{4}$  inch up to 3 inches. Standard FLEXO JOINTS are made of bronze and designed for working steam pressures up to 250 lbs., however, we can furnish them for any steam pressure up to 1350 lbs.

Install FLEXO JOINTS in pipe lines that are moved or swung in different directions or on machinery or equipment that must be supplied with any fluid while in motion.

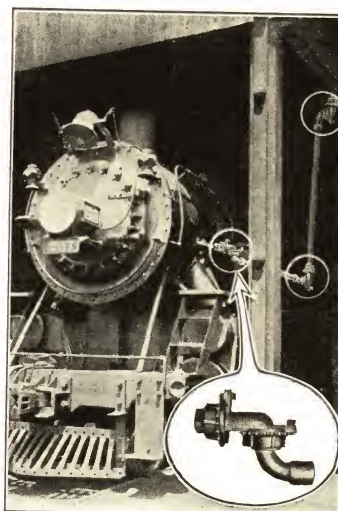


Style "A"  
For Revolving Machinery

Style "B"  
For Right Angle Bends

Style "F"  
Double Angle  
Return Bend

Style "H"  
Universal Joint.  
Swings in All Directions



Locomotive Blower Line  
Made Up of Pipe and Flexo Joints

FLEXO JOINTS will swivel through 360° yet there is no restriction of the flow of fluid through the fitting. There is a full pipe area in all positions.

#### WRITE FOR DETAILS

FLEXO JOINTS are used everywhere in industry. Send us a brief description of your requirements as we undoubtedly have a record of a similar application and can give you definite and concise information.

*Complete bulletin sent free.*



# FOOTE GEAR WORKS, INC.

11301 SOUTH CICERO AVE., CICERO, ILL.

(Chicago Suburb)

*Manufacturers of Gears of All Kinds, Speed Reducers, V-Belt Drives, Couplings*

## PRODUCTS:

Heavy duty cut gears and pinions of all kinds: Spur, herringbone, bevel, mitre, helical, spiral, worm in all sizes and any quantity. Racks, herringbone speed reducers, worm gear speed reducers, motorized herringbone and worm gear speed reducers. Roller chains and sprockets, belt drives, couplings, special machinery.

## ENGINEERING SERVICE:

Our engineering department has been able to solve many unusual speed reduction problems. Perhaps we can assist you. Send us your problems and we will give you the benefit of our more-than-35-years experience, without cost or obligation.

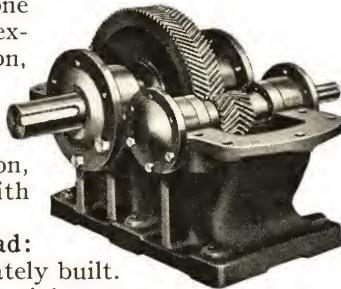
## LITERATURE:

Literature on gears, speed reducers, V-belt drives. Data are also supplied on special equipment.

## HERRINGBONE SPEED REDUCERS:

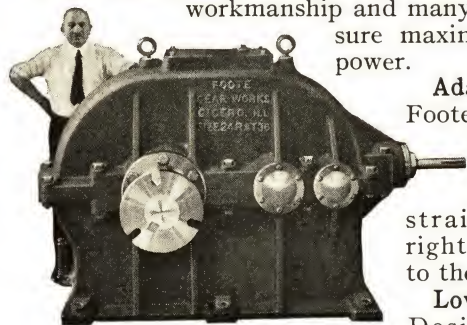
83 Ratios,  $\frac{1}{4}$  Horsepower to 475 Horsepower.

Brad Foote Herringbone Speed Reducers are extremely quiet in operation, smooth running. The gears are accurately cut to extremely close limits, bearings are anti-friction, designed to operate with minimum power loss.



**Built for Extra Overload:** Perfectly balanced, accurately built. Extra heavy where strains might occur.

**High Efficiency:** The scientific designing, accurate workmanship and many refinements assure maximum delivery of power.

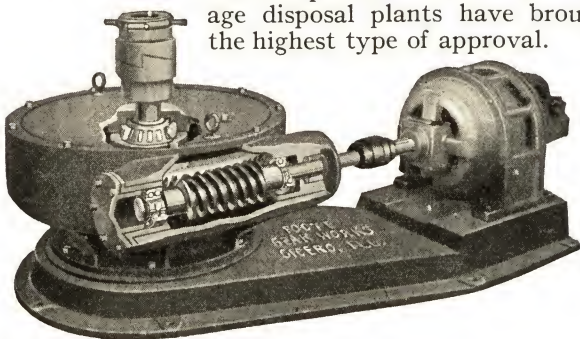


**Adaptability:** Brad Foote Speed Reducers are adapted to transmit power in a straight line or at right angles, either to the left or right.

**Low Maintenance:** Designed for low maintenance cost. No care required except to occasionally check the oil level.

**Scientific Engineering:** Brad Foote Speed Reducers are the "last word" in engineering. They are the result of more than 35 years experience.

Our installations in many of America's foremost industrial plants, breweries and sewage disposal plants have brought the highest type of approval.

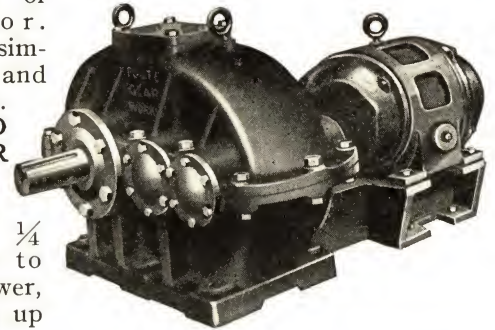


CICERO, ILL.

## MOTORIZED HERRINGBONE SPEED REDUCERS:

83 Ratios,  $\frac{1}{4}$  Horsepower to 475 Horsepower.

Motorized Herringbone Speed Reducers may be secured in ratios and horsepower to meet practically any condition of power reduction. These units are supplied with any type and make of motor.



Safe, quick, simple, efficient and low in upkeep.

## MOTORIZED WORM GEAR SPEED REDUCERS:

From  $\frac{1}{4}$  Horsepower to  $7\frac{1}{2}$  Horsepower, Ratios 8 to 1 up to 60 to 1.

Brad Foote Motorized Worm Gear Speed Reducer, highly efficient and suitable for all types of installations, all bearings anti-friction, with oil and dust proof housings, hardened, ground and polished high grade steel worm; highest quality bronze worm gear; horizontal or vertical and ranging from fractional horsepower up to  $7\frac{1}{2}$  horsepower, any desired motor; both alternating and direct current; free floating of motor shaft provided for; also a double safety to prevent oil from entering the field of motor. The installation of the unit is very simple, and this design eliminates a base for mounting reducer and motor; also a coupling for connecting motor to reducer. Slow speed shaft horizontal or vertical.



## WORM GEAR SPEED REDUCERS:

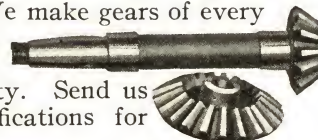
From  $\frac{1}{4}$  Horsepower to 25 Horsepower.

Brad Foote Worm Gear Speed Reducers with worm at top or bottom or with slow speed shaft in vertical position, anti-friction bearings, dust and oil proof housings—finest construction, greatest efficiency. Dependable, low maintenance.

## GEARS OF ALL KINDS:

All sizes, any quantity, for every purpose.

Brad Foote Gears are famous for quality, accuracy, dependable service. We make gears of every type, in all sizes and in any quantity. Send us your specifications for quotations.



**V-BELT DRIVES:** Submit specifications.



## FORD CHAIN BLOCK COMPANY

2ND AND DIAMOND STREETS, PHILADELPHIA, PA.

*Manufacturers of Hand Operated Chain Hoists and Trolleys*

### FORD HOISTING EQUIPMENT

Ford Tribloc Chain Hoists  
Extended Hand Wheel Hoists  
Twin Hook Hoists  
Tribloc Army Type Hoists



Low Headroom Trolley Blocks  
Trolleys  
Ford Screw Hoists  
Differential Hoists

### FORD TRIBLOC HOISTS

This is a spur geared type of chain hoist using high grade malleable castings in its construction. It is efficient and durable.

The load chain is high carbon steel, electrically welded and tested. This chain has high tensile strength, ability to withstand abuse and wear yet is sufficiently ductile to withstand shock loads.

Hand hook is of ball bearing construction, allowing the load to be turned in any position. Hook is attached to chain with drop forged shackle and oval bolt.

A malleable iron hand chain guide is provided to prevent fouling of hand chain. It permits pulling from any angle below the hoist.

Made in capacities from  $\frac{1}{4}$  to 40 tons.



### FORD SCREW HOISTS

A light weight hoist designed for rigger use or where necessary to continually carry the hoist from one location to another.

It is made on the worm and screw principle, of simple construction, and it will hold the load securely at any position until released by a reverse pull on the hand chain.

Hand wheel is equipped with a hand chain guide which permits operation from any position below the hoist and prevents fouling of hand chain.

Load chain is electrically welded carbon steel, each link gauged and tested.

Load hook is equipped with detachable shackles which permit easy replacement of chain or hook.

Fills the need for a light weight durable hoist for use where there is a minimum of headroom.

Made from  $\frac{1}{4}$  to 10 ton capacities.



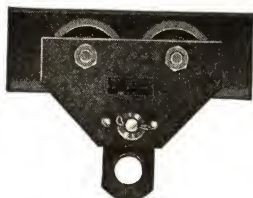
### FORD DIFFERENTIAL HOISTS

A low price hoist suitable for use where loads are to be lifted occasionally. Speed compares favorably with spur geared type but the amount of effort required to lift load is much greater. It has an advantage in its light weight, portability and price.

Suitable for use in the garage, small machine shop, for ash removal, etc.

All parts and chain are made from high grade materials thoroughly tested.

Made in capacities from  $\frac{1}{4}$  to 2 tons.



### FORD TROLLEYS

Available in plain or geared types. Equipped with Hyatt Roller Bearings which provide easy starting, fast rolling speed and minimum of maintenance. Side plates are steel.

Made in capacities  $\frac{1}{4}$  ton to 20 tons for all sizes of runway beams.

## GLOVER MACHINE WORKS

MARIETTA, GEORGIA

Subsidiary Plant

GLOVER STEEL COMPANY

CORDELE, GEORGIA

### PRODUCTS

Basic Electric Cast Steel Pipe Fittings; Miscellaneous Machinery and Parts; Car, Locomotive and Bridge Castings, Etc.



### FLANGED PIPE FITTINGS

for

150 Lbs. Working Steam Pressure at 500°F.  
300 Lbs. Working Steam Pressure at 750°F.  
400 Lbs. Working Steam Pressure at 750°F.  
600 Lbs. Working Steam Pressure at 750°F.  
900 Lbs. Working Steam Pressure at 750°F.  
1500 Lbs. Working Steam Pressure at 750°F.



### SCREWED FITTINGS

for

300 Lbs. Working Steam Pressure at 750°F.  
600 Lbs. Working Steam Pressure at 750°F.



### SPECIAL FITTINGS

Alloy Steel

GLOVER Supplies

Flanged and Screwed

Fittings of Alloy Steel

to customer's requirements.



# FOSTER ENGINEERING CO.

109-113 MONROE STREET, NEWARK, N. J.

*Manufacturers of Automatic Valves*

Foster representatives, capable sales engineers, thoroughly informed on Automatic Valve Problems, are located in all principal cities throughout the United States, Canada and Foreign Countries. Refer your valve problems to the nearest representative.

Foster Automatic Valves have been selected as a standard since 1879, meeting the most exacting service requirements of the United States Government and industrial utilities. Over seventy selective types available to meet extreme pressures, temperatures and intermittent service conditions.

## PRODUCTS:

Pressure Reducing Regulators for saturated or superheated steam, 0 to 900 lb., 750° total temperature.



Relief valves for saturated or superheated steam, air, water, etc.

Pump Governors, excess, constant, vacuum and differential type.

Float Valves, steam, water, air, etc.

Fan Engine Regulators, forced or industrial draft systems.

Back Pressure Valves, steam, water, air, etc.

Altitude Valves for one or two pipe open or closed water systems.

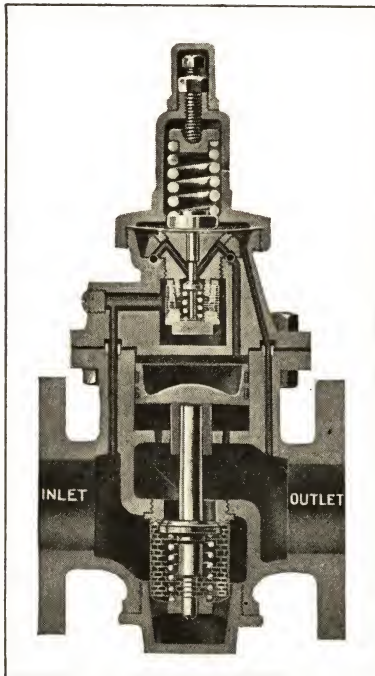
Non Return Stop and Check Valves, for saturated and superheated steam.

Vacuum Breakers—0 to 30".

Sight Flow Boxes, water, oil and other fluids.

Balance valves for steam, air, water, etc.

## AUTOMATIC PRESSURE REDUCING REGULATORS:



Class G-2, sizes  $\frac{1}{2}$  to 12"—Single Seated, Pilot Operated. For severe intermittent service on saturated or superheated steam. Initial pressure 50 lbs. to 900 lbs., 750 degrees total temperature, to within 10 lbs. of initial pressure (wide spring ranges. Variable initial pressure has no effect on the delivery side. Simple and rugged in construction. Pilot units interchangeable  $\frac{1}{2}$  to 4";  $4\frac{1}{2}$  to 6"; 7 to 10".

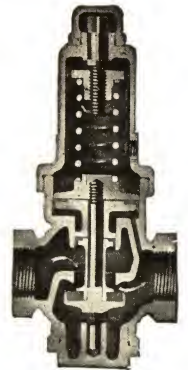
## NON RETURN VALVES

For saturated or superheated steam, 750 degrees total temperature. A valuable safety device, simple and rugged in construction for installation on a battery of boilers or headers. Automatically prevents steam returning from the header into a lower pressure or disabled boiler. Full pipe area allows full flow through valve when pressures equalize.

Semi or cast steel—sizes  $2\frac{1}{2}$  to 12".

## WATER AND AIR RELIEF VALVES

Suitably constructed for 4000 lbs. pressure  $\frac{1}{2}$  to 4" bronze composition, internal working parts hardened stainless steel. Other types suitable for steam, gas, ammonia, brine, etc.



## PUMP GOVERNORS

Excess, constant, vacuum and differential types. Type "H" illustrated. Automatically maintains a fixed excess discharge pressure in boiler feed lines above the boiler pressure. Adaptable for either reciprocating or turbine boiler feed pumps.



## FLOAT VALVES

Pilot and Direct Acting Types. For installations on open or closed tanks, controlling steam to pumps or to maintain a constant water level.





# JULIEN P. FRIEZ & SONS, INC.

A Subsidiary of the Bendix Aviation Corporation

BALTIMORE STREET AND CENTRAL AVENUE, BALTIMORE, MD.

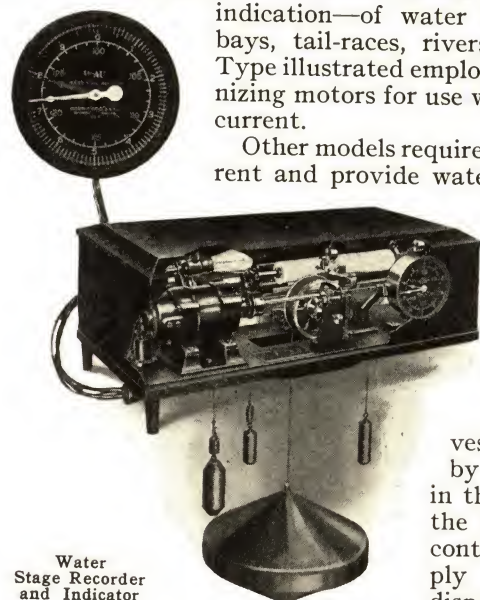
Manufacturers of Meteorological, Hydrometric and Air Conditioning Instruments

## PRODUCTS:

Recording and Indicating Instruments for Temperature, Humidity, Barometric Pressure, Altitude, Rainfall, Sunshine, Wind Direction and Wind Speed, Weather. Liquid Level Recorders and Indicators.

## WATER STAGE RECORDER AND INDICATOR:

Provides a graphic record at the source—and remote indication—of water levels in forebays, tail-races, rivers and streams. Type illustrated employs self-synchronizing motors for use with alternating current.



Water Stage Recorder and Indicator

Other models require on electric current and provide water level records at the location of the recorder. These models are used extensively by the U. S. Government in its river flow investigations and by municipalities in the obtaining of the data for flood control, water supply and sewage disposal studies.

Automatic Controls, Humidistats, Thermostats. Thermometers, Sling and Aspirating Psychrometers. Complete Control Assemblies for Air Conditioning Fields.

## CATALOG:

Write for complete *Catalog No. 5-M.*

## HUMIDISTATS, THERMOSTATS, HUMIDITY AND TEMPERATURE INDICATORS:

Extremely sensitive, accurate and reliable Automatic Controls and Indicators for humidity and temperature for all classes of industrial and domestic Air Conditioning applications. Incorporate specially prepared, multiple human hair elements.



Controls available in high or low voltage for two or three wire system circuits. Attractively finished and of superior performance but at very low list and net prices.

Also Complete Control Assemblies for Air Conditioning equipment.

Write for *Bulletin MK.*



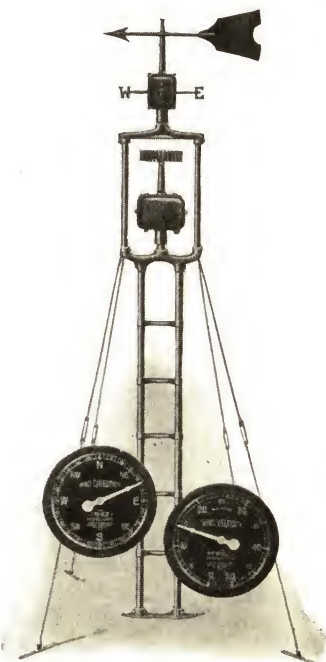
## AIRPORT EQUIPMENT:

For indicating and recording all meteorological conditions important to aviation.

## WIND DIRECTION AND VELOCITY INDICATORS AND RECORDERS:

Complete instrument assemblies for indicating and recording wind direction and velocity. The type illustrated gives distant indications by means of self-synchronizing motors. The same transmitters may be used to operate a recorder writing a graph of every minute fluctuation in either velocity or direction. The installation may include a combination of both indicators and recorder or either may be employed separately.

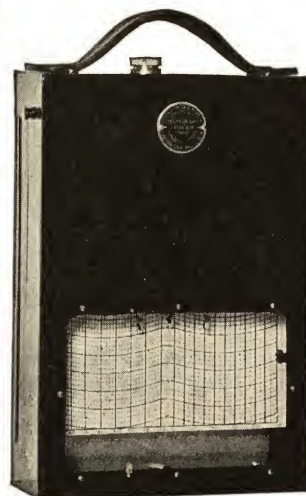
This is but one of several types of wind instrument equipment. Complete details of all are available and will gladly be dispatched upon request.



Wind Direction and Velocity Indicator

## RECORDING INSTRUMENTS FOR HUMIDITY, TEMPERATURE AND OPERATION:

Designed for hard service by all engaged in heating, ventilating, oil burning, refrigerating and air conditioning fields and for many industrial uses. These new recording instruments incorporate many innovations, are easily portable and compact (weight 52 oz., size  $8\frac{1}{2}'' \times 5\frac{1}{2}'' \times 2\frac{1}{4}''$ ), available in several forms for various ranges of time and temperature and with or without operation record. Charts,  $3'' \times 5''$ , are of index file card type. This range of instruments is offered at extremely attractive prices. Write for *Bulletin MG.*



## STANDARD MEASURING AND RECORDING INSTRUMENTS:

Those who require high quality instruments for laboratory and similar work should obtain particulars of our Friez Hygro-thermographs, Hygrographs, Thermographs, Sling and Aspirating Psychrometers, Thermometers, Barographs, Anemometers. Write for *Catalog M5.*



# THE GARLOCK PACKING COMPANY

GENERAL OFFICES AND FACTORIES  
PALMYRA, N. Y.

IN CANADA: The Garlock Packing Company of Canada, Limited, MONTREAL, QUEBEC

CANADIAN FACTORIES: HAMILTON, ONTARIO

A World Wide Organization with Sales Offices and Warehouses in All Principal Industrial Centers

## RANGE OF GARLOCK PRODUCTS

THE GARLOCK PACKING COMPANY manufactures in its own factories a complete line of Quality Controlled Mechanical Packings and Asbestos and Rubber Products.



## CATALOGUE

Full description of our standard products is contained in our *B-1932 Catalogue*. A special *Metal Packing Catalogue* contains valuable metal packing information. Write for these books. A Garlock Representative is in your vicinity. He will gladly call upon request.

## ROD PACKINGS

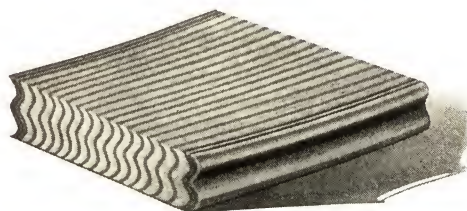
Asbestos, rubber, flax, semi-metallic, full metallic and combination packings of every description, for ser-



Garlock 150 High Pressure Packing

## GASKETS

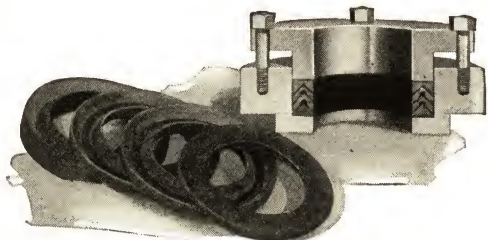
Gaskets in any size and of every type including the new resilient Garlock Guardian semi-metallic gaskets.



Garlock Guardian Gasket (Cross-Section View)  
(Patent Applied For)

vice against hot or cold water, steam at any pressure or temperature, air, ammonia, gases, hot or cold oils, acid and alkali solutions and process liquors of every kind.

A recent and outstanding development of the Garlock factories is Garlock Chevron, an automatic packing, designed and recommended for extreme heavy duty



Garlock Chevron Packing (Patented)

service. Use Garlock 430 Chevron for hydraulic service. For high temperatures use Garlock 530 Chevron.

## SHEET PACKINGS

Our complete line of sheet packings includes:  
Garlock 22—Red rubber sheet.  
Garlock 24—Wire inserted red rubber sheet.  
Garlock 19—Duck inserted rubber sheet.  
Garlock 353—Oil resisting black rubber sheet.  
Garlock 660—Cork-fibre sheet for gasoline, oil and water.  
Garlock 900—Compressed asbestos high pressure steam sheet.  
Garlock 7021—Asbestos sheet for hot oils and gasoline.  
Garlock 619—Diaphragm sheet.

## BRAKE LINING

Garlock 701 Industrial Brake Lining is constructed of high quality asbestos cloth impregnated with a special rubber compound, then folded, molded and vulcanized under 2000 lbs. pressure. Gives long service on all industrial equipment.



Garlock 701 Industrial Brake Lining

## BELTING

Garlock Rubber Transmission Belting is a superior belting for long and dependable service. It has unusual flexibility, remarkable gripping power and great strength.



## GARLOCK LUBRICATING PASTE

Improves the performance of packings in service and makes them last longer. Compound No. 2 is for packings operating against steam and water. Compound No. 3 is for packings operating against gasoline and oils.



# GASO PUMP & BURNER MFG. COMPANY

TULSA, OKLA.

EXPORT OFFICE: 149 Broadway, NEW YORK CITY

## PRODUCTS

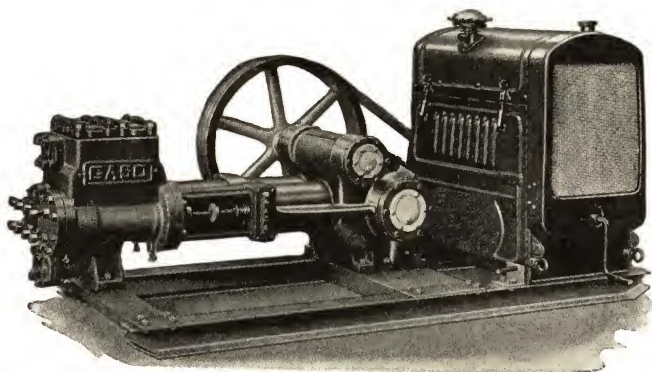
Walking Beam Pumps—for Oil or Water  
 Gas Driven Suction and Discharge Pumps  
 Walking Beam Pumps—for Gas or Vacuum  
 Motor Driven Pumps  
 Piston Power Pumps  
 Engine Driven Pumps  
 Rodline Pumps  
 Portable Pumping Plants  
 Steam Discharge and Suction Pumps  
 Pipe Line Fittings

For higher pressures at fairly large capacities. Drive: Diesel Engine, electric motor or gas engine by "V" belt, or direct to gas or oil engine.

Size Pump, Inches	Rating			R. P. Ms.	Pipe Size		Gear Ratio
	Gals. Per Min.	Bbls. Per Hr.	Working Pressure		Suc., In.	Dis., In.	
2½ x 10	38	54	1400	54	4	3	Ar-ranged to suit conditions
3 x 10	57	82	1000	54	4	3	
3½ x 10	81	116	750	54	4	3	
4 x 10	109	156	700	54	4	3	
4½ x 10	140	200	650	54	4	3	
5 x 10	175	250	600	54	4	3	

## GASO DUPLEX PISTON POWER PUMP

2½" to 4" x 6"—FIG. 1844



Gaso Fig. 1844 Power Pump Unit with Combination Gas and Gasoline Engine, Mounted on Steel Skids

Compact, light, complete; to meet conditions in declining fields and on smaller leases. Can furnish pump separately; also electric motor driven by "V" belt, mounted on skids.

All-Timken-Bearing, center driven gears, operating in oil bath. Interchangeable liner fluid end. Can furnish with acid-resisting bronze fluid ends, for acidizing wells.

Size Pump, Inches	Rating			R. P. Ms.	Pipe Size	
	Gal. Per Min.	Bbls. Per Hr.	Working Pressure		Suc., In.	Dis., In.
2½ x 6	35	50	650	70	3	2
3 x 6	49	70	500	70	3	2
3½ x 6	65	94	450	70	3	2
4 x 6	90	128	350	70	3	2

## GASO DUPLEX PISTON ENCLOSED HIGH PRESSURE DISCHARGE PUMP

FIG. 1742—Side Pot Type

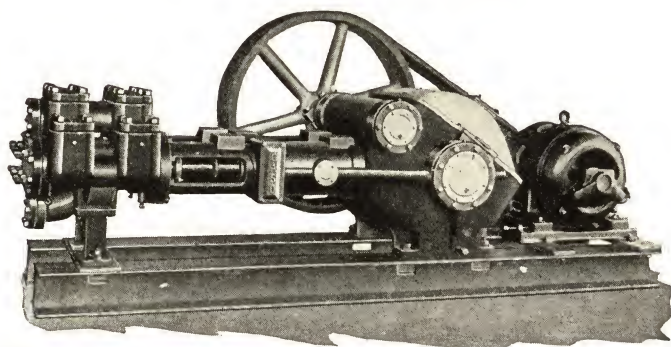


Fig. 1742 Gaso Duplex Piston Pump with "V" Rope Drive from Electric Motor—Mounted on Steel Skids

Similar to Figures 1740 and 1741, but equipped with side pot type fluid end. Frame can take fluid ends 1740 and 1741. Durable Stainless Steel valves, bronze seated; or all bronze equipped. All-Timken-Bearing; center driven Herringbone gears, operating in oil bath.

## GASO PORTABLE PUMPING PLANTS

FIGURES 2010-S and 2010-W

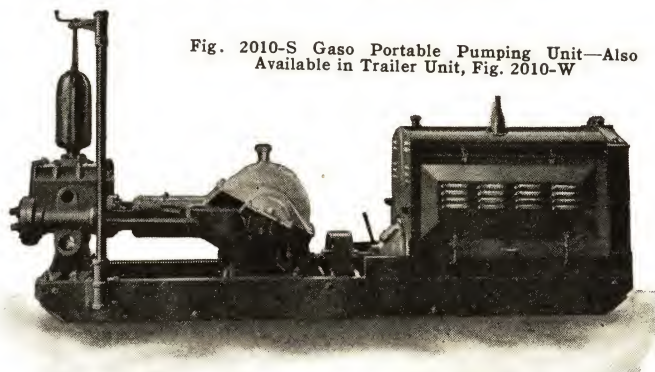


Fig. 2010-S Gaso Portable Pumping Unit—Also Available in Trailer Unit, Fig. 2010-W

Ideal for permanent or semi-permanent pipe line stations, pick-up in case of line break, water, mudding or cementing, and general service. Trailer unit has full spring equipment and Timken Bearings and can be transported at truck speed.

Bronze ring gear and hardened steel worm permit direct connection to high speed driver, using steel flexible coupling through one set of gears. Engine is Buda Oil Field Power Unit No. 50, extra heavy duty, using natural residue gas or gasoline.

Size Pump, Inches	Rating			R. P. Ms.	Pipe Size	
	Gals. Per Min.	Bbls. Per Hr.	Working Pressure		Suc., In.	Dis., In.
2½ x 10	45	63	800	54	4	3
3 x 10	65	92	600	54	4	3
3½ x 10	90	128	450	54	4	3
4 x 10	112	160	400	54	4	3
4½ x 10	140	200	300	54	4	3
5 x 10	175	250	250	54	4	3
6 x 10	244	348	225	50	6	4
7 x 10	333	475	175	50	6	4

## GASO PISTON POWER AND WALKING BEAM PUMPS

Gaso Piston Power (Jerker) Pumps are suitable for both main pipeline high-pressure work and lease or other low pressure work, where push and pull or crank power can be utilized. Sturdily built with few parts. Cylinder diameters 3 to 5 inches; capacities, 31.73 to 157.36 barrels per hour.

Gaso Walking Beam Pumps are for leases where no power is available, connecting direct to beam. Figure 601 here shown is for oil or water. Figure 604 is for gas or vacuum. Figure 601 capacities, 30.30 to 55.10 barrels per hour. Figure 604, cylinder diameters, 14" to 20"; points vacuum, 26 to 28.



Fig. 301 Gaso Piston Power Pump



Fig. 601 Gaso Walking Beam Pump



# THE GATES RUBBER COMPANY

999 So. BROADWAY, DENVER, COLO.

*Gates Vulco V-Belt Drives*

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HOBOKEN, N. J., Hoboken Terminal Building

DALLAS, TEX., 1712 Laws Street  
LOS ANGELES, CAL., 747 Warehouse Street

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CASPER, WYO. . . . 448 So. Spruce St.  
CHARLESTON, W. VA. . . . 613 Summers St.  
CHARLOTTE, N. C. . . . 601 Builders' Bldg.  
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CINCINNATI, OHIO . . . 1102-06 Broadway  
CLEVELAND, OHIO . . . 3060 W. 155th St.  
COLUMBUS, OHIO . . . 370 W. Broad St.  
DALLAS, TEX. . . . 1710 Laws St.  
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LOUISVILLE, KY. . . . 1197 Stark Bldg.  
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MILWAUKEE, WIS. . . . 744 No. 4th St.  
MINNEAPOLIS, MINN., 529 So. Seventh St.  
NEW YORK, N. Y., Room 314 E, 30 Church St.  
NEW ORLEANS, LA., 314 Pan-American Bldg.

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SAN FRANCISCO, CAL. . . . 57 California St.  
SEATTLE, WASH. . . . 206 First Ave., So.  
SPRINGFIELD, MASS., 818 Belmont Ave.  
SPOKANE, WASH. . . . Div. St. and O. W. R. & N.  
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TULSA, OKLA. . . . . 1023 E. 17th Place  
WICHITA, KAN. . . . . 739 No. Main St.

## PRODUCTS

### GATES VULCO ROPES:

For multiple "V," V-Flat and Quarter-Turn Drives.

### GATES VULCO CORD BELTS:

A superior belt for light machinery drives.

### GATES DUBL-V BELTS:

For power transmission to sheaves from top and bottom of belt.

### Construction of Gates Vulco V-Belts

**Rubber-Filled Cords:** Dry cotton cords are passed through liquid rubber (Latex) and then dried. A thin film of pure rubber surrounds each cord. In addition, the rubber penetrates inside the cord and binds together the individual fibers. This patented, rubber-filling process prevents internal chafing and accounts for the long life of Gates V-Belts.

**Concave Sidewalls:** All Gates Vulco Ropes and Vulco Cord Belts are molded with slightly concave sidewalls. As the



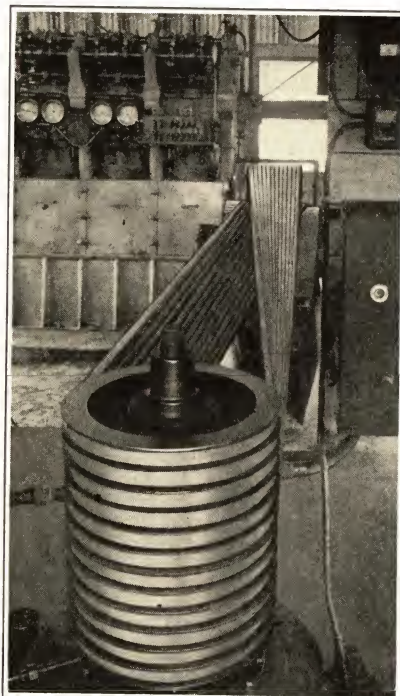
Gates Belt bends around the sheaves, the sidewalls straighten out to a firm and uniform contact against the sides of the sheave groove. This feature is important because it makes possible the transmission of full horsepower with minimum belt tension.

**Bias-Cut Cover:** A strong and flexible multiple ply cover of bias-cut friction fabric protects the inner core of the belt from dirt and moisture and resists the action of oil.

### Gates Vulco Quarter-Turn Drives

Gates Vulco Ropes are more satisfactory than gears on Quarter-Turn Drives because they are clean and quiet and because they absorb shocks.

They are more satisfactory than flat belts because they operate on shorter centers with no slippage.



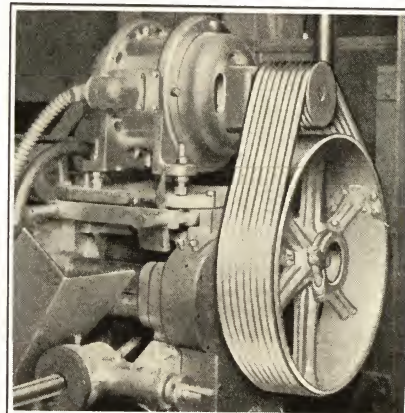
Twelve 600D Vulco Ropes on Quarter-Turn Drive from 150 Hp. Diesel Engine to Deep Well Pump

### Gates Vulco Rope Drives

Gates Vulco Rope Drives have definite advantages over other types of power transmission equipment. Some of these advantages are:

- Positive transmission of power
- High efficiency
- Dependability
- Cleanliness
- Quietness
- Compactness
- Shock absorbing characteristics
- Ease of installation
- Low maintenance cost

In a Gates Vulco V-flat drive a flat pulley is substituted for the large grooved sheave. Gates V-flat drives are just as satisfactory as the ordinary two-sheave drive and with speed ratios greater than 2:1 or 3:1, they cost less.



5 Hp. V-Flat Drive on Lead Stripping Machine



## E. M. DART MFG. CO.

PROVIDENCE, R. I.

Canadian Factory: DART UNION CO., LTD., Toronto

SELLING AGENTS

THE FAIRBANKS COMPANY, 393-399 Lafayette St., New York, N. Y.

BRANCH HOUSES: BOSTON, MASS., NEW YORK, N. Y., PITTSBURGH, PA.

Distribution in All Principal Cities

### DART UNION COUPLINGS:

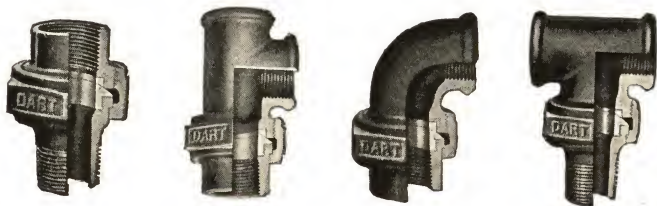
The Dart Union Pipe Coupling is made of extra-heavy, best grade, malleable iron pipe ends and nut, and has two non-corrosive bronze metal seats swedged into recesses made to receive them, accurately machined to a true arc or ball-joint and carefully ground together with oil and corundum, producing a doubly protected joint, non-corrosive and requiring no packing.

The Dart Union may be described as partaking of all the advantages of the Brass Union and the Iron Union, with none of the disadvantages of either, notably, in the case of brass unions, stretching on account of softness; or, in the case of the iron, forming a "flake" and corroding.

The Dart has a straight way through the union, with no cored parts to weaken, hold water, or collect sediment.

The shoulder on the swivel end of the Dart is extra-heavy, strong, and durable; note the heavy malleable iron nut, which also has a heavy shoulder to support the swivel. Thus the two parts which come directly in contact with each other, and which have to withstand the excessive strains sometimes applied in making-up, are stronger than would ever be required.

The pipe ends are chamfered and are threaded to American standard. This saves labor in installing, as poor threads cause no end of annoyance.



Dart malleable iron screwed Unions, sizes  $\frac{1}{8}$ " to 2", inclusive, are recommended for 300 pounds working steam pressure and sizes  $2\frac{1}{2}$ " to 4", inclusive, for 250 pounds working steam pressure where the temperature is not in excess of 450 degrees Fahrenheit.

If you are not acquainted with the Dart Union, a sample of any style will be gladly sent so that you may test it out your own way on your own job.

### DART FLANGE UNIONS:

Dart Flange Unions are made of extra-heavy gray iron castings, tapped with sharp, clean threads and accurately machined. The distinguishing features of the Dart Flange, likewise, are its two spherical bronze metal rings, forced into grooves made to receive them, which are leak-proof, trouble-proof, rust-proof and corrosion-proof, and which require no packing to always keep in perfect condition. Dart Flanges can be used on pipes even if alignment is not quite true.

Bolts and nuts furnished are of the best quality.

Dart Flanges are also made in a double extra-heavy pattern.



## THE FAIRBANKS COMPANY

393-399 LAFAYETTE ST., NEW YORK, N. Y.

*Manufacturers of Valves*

FACTORY: BINGHAMPTON, N. Y.

BRANCHES: BOSTON, MASS., PITTSBURGH, PA.

Distributors in All Principal Cities

### PRODUCTS

Manufacturers of Bronze and Semi-Steel Globe, Gate and Check Valves, Sphero Valves, Asbestos Packed Cocks, etc.

#### FAIRBANKS BRONZE GLOBE VALVES

For 225 lbs. S.W.P. in sizes  $\frac{1}{4}$ " to  $1\frac{1}{4}$ " and 200 lbs. S.W.P. in sizes  $1\frac{1}{2}$ " to 3".

This valve is especially designed for easy renewability of all working parts. The seat ring of hard bronze is renewable. The renewable disc is of resilient Vulcanite which will not flake or chip off. The Navy-type, two-piece union bonnet not only provides added strength but insures a tight joint after each removal for parts repairs.

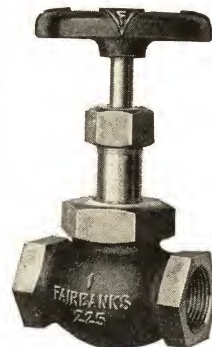


Figure 0510

#### FAIRBANKS ALL BRONZE "FM" CHECK VALVES

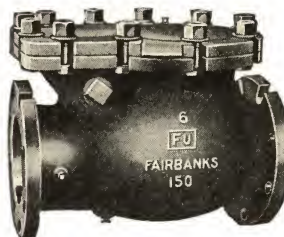


Figure 0713

An all bronze check valve made in 6" and 8" sizes and in accordance with specifications of The Associated Factory Mutual Fire Insurance Companies. It meets the requirements of the new sanitary codes of many States. Pressure gauges and other fixtures supplied on request.

#### FAIRBANKS SEMI-STEEL GATE VALVES

For 175 lbs. S.W.P. Semi-Steel casting, bronze mounted, of solid wedge pattern, these valves are designed with a very liberal safety factor. Available in either screwed or flanged connections, rising or non-rising spindle.

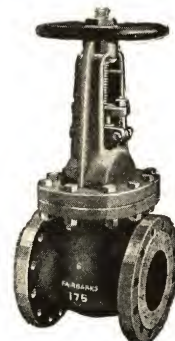


Figure 0428

#### FAIRBANKS "SPHERO" VALVES

Illustration is a sectional view of the "Sphero" ball-type, quick-opening valve. Designed as a blow-off valve, its superiority in this service has brought recognition of its adaptability in many classes of service. It provides a round, full pipe-size waterway, an external tightening adjustment, a quarter turn operation and easy renewal of parts without removing the valve from the line. Designed for 200 lbs. steam working pressure.

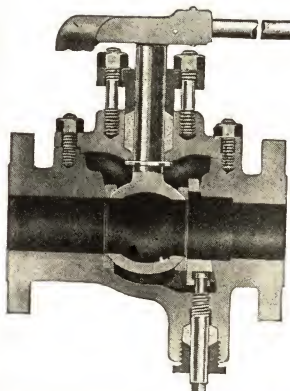


Figure 0850 S.E. Figure 0851 F.E.



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TACOMA, WASH. . . . . 1019 Pacific Avenue  
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UTICA, N. Y. . . . . 258 Genesee Street  
WASHINGTON, D. C., 806 Fifteenth Street, Northwest  
WATERBURY, CONN. . . . . 72 W. Liberty Street  
WICHITA, KAN. . . . . 116 South Main Street  
WORCESTER, MASS. . . . . 165 Commercial Street  
YOUNGSTOWN, OHIO . . . . . 25 E. Boardman Street

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HAWAII: W. A. Ramsay, Ltd., HONOLULU

Motor Dealers and Lamp Agencies in All Large Cities and Towns

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MILWAUKEE . . . . . 940 West St. Paul Avenue  
MINNEAPOLIS . . . . . 410 Third Avenue, North  
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Distributor for the General Electric Company outside of the United States and Canada

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NEW YORK, N. Y., 570 Lexington Ave.

SCHENECTADY, N. Y.

Cable Address: "INGENETRIC," New York

Foreign Offices, Associated Companies and Agents in Principal Cities of the World

## G-E SALES CHANNELS:

The General Electric Company has established sales offices at convenient points for the extension of service to its customers and to those interested in its products.

Any information required pertaining to the application of electricity and electrical equipment may be had by addressing the nearest G-E Sales office listed above—complete information is always available in the form of personal advice or literature.

G-E products are marketed by: (1) Direct Sales to purchaser.



(2) Sales through merchandise and specialty appliance distributors. (3) Sales through allied companies and other manufacturers of appliances. (4) Sales through dealers.

G-E distributors are located in all large cities.

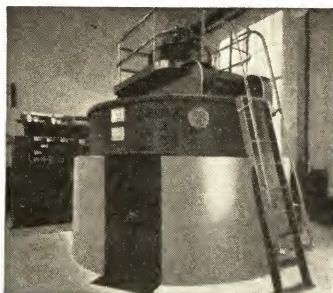
G-E motor dealers and lamp agents are located in every city and large town.

## G-E SERVICE SHOPS:

G-E Service Shops in 23 large industrial centers give prompt service in repairs.

## HYDRO-ELECTRIC STATION EQUIPMENT:

G-E manufactures water wheel-driven generators in a range of capacities up to the largest installed at the present time. Horizontal and vertical types; individually designed to meet most efficiently, the various requirements imposed by supply of water available and operating conditions involved. *Bulletins GEA-820A and GEA-739A.*



back pressures up to 40 lbs.; and for speeds (which are adjustable) from 1200 to 4000 r.p.m. Gear-turbines for speeds from 300 to 3000 r.p.m. are also available.

Exhaust steam is free from oil and may be used for many low-pressure heating and manufacturing processes. *Bulletin GEA-1145B.*

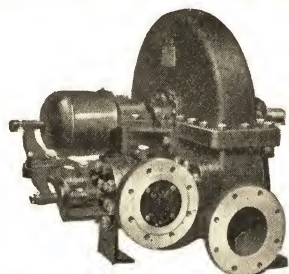
A.C. turbine-generators are built in sizes from 10 kw. to the largest commercial sizes for all standard voltages.

D.C. turbine-generators are built in sizes from 10 kw. to 4000 kw. for standard voltages. *Bulletins GEA-1011C.*

## G-E GENERATORS FOR ENGINE DRIVE:

For steam and internal combustion engines. All standard capacities and speeds, A.C. and D.C. *Bulletin GEA-383D.*

## STEAM TURBINES AND TURBO-GENERATORS:



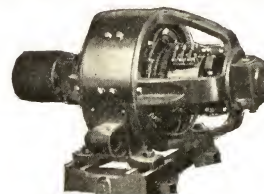
Built to drive centrifugal pumps, fans, blowers, compressors, paper machines, coal pulverizers and similar apparatus. Used also for stand-by service. Impulse type; several sizes, with one, two or three wheels to meet various requirements. Built for condensing or non-condensing operation, for either direction of rotation. Adaptable for steam pressures from 80 to 400 lbs.; steam temperatures up to 750° F.;

## SYNCHRONOUS MOTOR-GENERATORS:

Standard line from 50 to 6000 kw., 25, 50 and 60 cycles, 125 to 600 volts. Can be arranged to start from A.C. or D.C. end. *Bulletin GEA-1598.*

## G-E BELT DRIVEN GENERATORS:

For lighting, power and as exciters. Shunt or compound wound; with pulley and base. *Bulletins GEA-432B.*



Belt Driven Generator



# GENERAL ELECTRIC COMPANY

## SYNCHRONOUS CONVERTERS:

Commutating-pole for all commercial frequencies, voltages and capacities, for central station, transportation and industrial service.

## GENERATOR AIR COOLERS:

A closed system for circulating cooled air through generators, motors, converters, etc. Cooling medium is fresh or salt water. Materially improves operating characteristics. *Bulletins GEA-226.*

## TRANSFORMERS:

For power (all types of cooling) distribution, instrument, insulating low-voltage, high frequency, constant current, special, etc., in capacities from a few watts to the highest installed; 25, 50 and 60 cycle and voltages up to 230,000.

Bulletins covering any of these types mailed upon request.



Distribution Transformer

## G-E SWITCHGEAR:

G-E manufactures a complete line of switchgear for all systems of electrical distribution from small manual panels to the large automatic units for industrial, central station and railway application.

All auxiliary and supervisory equipment to make up the complete system can be furnished for indoor or outdoor installations. Send for bulletins covering your needs.



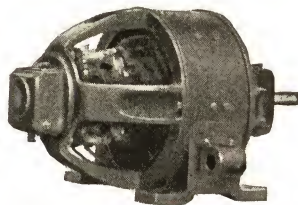
G-E Metal-Clad Switchgear, 13,200 Volts, Type MI-6

## G-E MOTORS:

G-E makes a complete line of motors for all applications in industry.

**Direct-current Types:** Shunt wound motors maintain good regulation.

The series motor is radically different from the shunt motor. Heavy torque of the series motor is excellent for the acceleration of loads possessing great inertia. The speed, however, varies inversely with the load and varies widely with the changing load.



Direct-Current Motor, Type CD

**Alternating-current Types:** The most common alternating-current motor used in industry is the squirrel cage polyphase induction motor. This motor is characterized by constant speed with excellent speed control—i.e., the difference between full load speed and no load speed is a small percentage. Squirrel cage polyphase motors are available in several different modifications, giving a choice of starting torque and starting current suitable for the wide variety of applications gener-

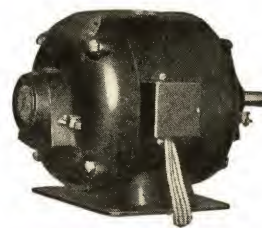


Induction Motor, 15 Hp., 1200 Rpm., 60 Cycles and Larger, Type K

ally encountered in industry. The squirrel cage polyphase motor is one of the simplest and least complicated general purpose motors available and can be operated with a minimum of maintenance and attention. It is available in a wide variety of mechanical modifications as well as in a choice of electrical characteristics as suggested above.

Other types of alternating current motors usually encountered in industry are for adjustable varying speeds on polyphase circuits and a variety of single phase motors used in special applications.

**Information Required when Ordering:** Duty, Service requirements; type, horsepower, speed and voltage. If for A.C. state frequency and number phases. If D.C., state shunt series, or compound. State whether open, semi-enclosed or totally enclosed. State accessories, standard or special, to be included. This information aids us in advising, suggesting and specifying, and directly simplifies your problem.

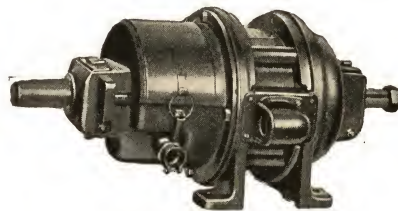


Type RSA Fractional Horsepower Motor

## G-E CRANE AND HOIST MOTORS:

Direct-current line of motors especially designed for hoists, and so designed that standard electrical brakes may be attached.

A.C. Motors are also available for either two or three phase operation, and are designated as MTC, 3 phase and MQC, 2 phase. Capacity 2 to 300 h-p. The construction of these motors is extremely simple and they will withstand hard usage encountered in this service. They have high starting torque and low flywheel effect.



A.C. Crane Motor

Drum Switches furnished for control of series shunt or compound wound motors. All live parts are completely covered.

Magnetic Crane Hoist Controls furnished for 230-volt series wound hoist motors provides creeping speeds on first two points hoisting and dynamic braking and power lowering.

## CONTROL FOR G-E MOTORS:

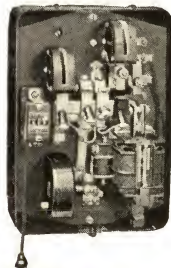
G-E has a complete line of reliable and efficient starting and controlling apparatus for the successful operation of A.C. or D.C. motors.

The line includes rheostats, compensators, starting switches, relays, pressure governors, pressure switches, float switches, pushbutton stations, drum controllers, resistors, magnetic controllers, automatic speed regulators, brakes and valves.

Where standard equipment cannot be applied, due to unusual problems, a complete control system can be designed to meet your needs.

## G-E SELSYN DEVICES:

G-E self-synchronous motion-transmitting of Selsyn devices provide a means for reliable, accurate, and rapid communication or control between distant or nearby stations. Various types of mountings are available. Practically any problem of remote signaling, control, or indication can best be solved with Selsyn devices. *Bulletin GEA-722A* gives complete information.



CR4166-A2 Magnetic Controller

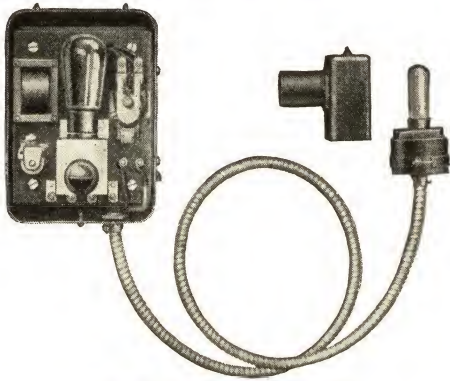


CR1034-K1 Compensator



# GENERAL ELECTRIC COMPANY

## G-E PHOTOELECTRIC RELAYS:



CR7505-A5 Photoelectric Relay

forms include devices to operate from A.C. supply lines; to operate from D.C. supply lines; those particularly designed for outdoor service; and those particularly designed for high-speed response and high sensitivity. In addition, light-source units for use in conjunction with the photoelectric relays are available.

Photoelectric relays are employed for counting, cutting, sorting, controlling machines, operating valves, inspecting, turning on and off signs, lighting equipment and many other uses.

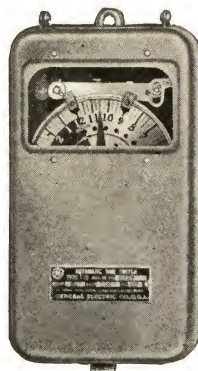
*Bulletin GEA-1654B* fully describes the complete line.

## RELAYS:

More than 200 kinds for current, voltage, direction, power, phase, frequency, temperature, control, etc. Send for bulletins covering type in which you are interested.

## G-E AUTOMATIC TIME SWITCHES:

For automatically opening and closing circuits indoors or outdoors. Powered by the "Telechron" motor. Equipped with plain 24 hour dial or an astronomic dial. Control one and two circuits, one and two pole, single and double throw—up to 30 amp. *Bulletin GEA-1427*.



Type T-13 Time Switch

## ELECTRICAL INSTRUMENTS:

G-E makes a full line of ammeters, voltmeters, wattmeters, frequency meters, power factor meters, etc., for panel mounting (flush or front-of-board) portable or laboratory, for A.C. and D.C. indicating and recording. Scales to cover all requirements. All needed shunts, resistors and transformers supplied with instruments. Send for bulletins covering instruments



Type AP-9 Portable Indicating Instrument

in which you are interested.

G-E also makes ground detectors for voltages up to 22,000: potentiometers for commercial laboratories and colleges; surge indicators and recorders. Send for bulletins.



Type H-5 Horizontal Edgewise Instrument

## OTHER G-E INSTRUMENTS:

**Dynamometers:** Made in both electrical or hydraulic type, or in combination. Sizes range from 2 h.p. to 1500 h.p. Speed range covers up to 5000 r.p.m. Write for *Bulletin GEA-544*.

For certain control problems, G-E photoelectric relays offer many definite advantages over more conventional control devices. Several forms of photoelectric relays are available to meet the various conditions of application. These

**Noise Meter:** A portable instrument for measuring and analyzing abnormal sound, noise or vibration in machinery. Write for *Bulletin GEA-1624*.

**Moisture Content Indicator:** A portable instrument for the determination of the moisture content of lumber. The instrument has a range of 7% to 24% in steps of 2%.

**Recording Color Analyzer:** A photoelectric instrument which automatically records the color curve of a sample. Send for *Bulletin GEA-1298*.

## G-E WIRE AND CABLE:

A full line of wire and cable for all purposes. Rubber insulated, braided, single and twin wire; lamp cord; portable cord; deck cable; fixture wire; all rubber cord. All commercial gages and conforming to Underwriters Codes.

Also magnet wire, all insulations, all gages. Deltasheston Wire and cable, asbestos covered, is supplied for switchboards, station cables, fixture wire, heater cords, stove wire and motion picture cable.

Write for detailed listing.

## G-E WIRING SUPPLIES:

G-E supplies complete requirements for interior and exterior wiring. All forms of Code wire, rigid and flexible conduit with fittings; steel armored (BX) and non metallic sheathed cable; fibreduct; outlet boxes and fittings; sockets, receptacles, switches, switch boxes, plates, convenience outlets, plugs, fuses, cable terminals, rubber and friction tapes, solder, fluxes, etc.

Consult nearest G-E dealer or distributor or write General Electric Company, Merchandise Department, Bridgeport, Conn.

## FLOODLIGHTING EQUIPMENT:

G-E manufactures complete equipment for floodlighting of buildings, construction jobs, railroad yards, etc. Also searchlights for use in conjunction with floodlighting or separate units up to 525,000,000 c.p. beam. Complete lighting for airports including, flood, boundary, ceiling and beacon lights.



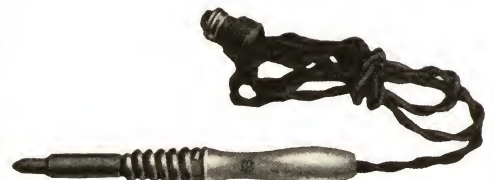
Type L-30 Projector with Clear, Lightly Stippled Lens

## G-E INSULATING MATERIALS:

G-E makes a full line of sealing and filling compounds, varnishes, paints, vehicles, stickers and shellacs for electrical insulating in the building, repair and maintenance of electric apparatus. Also paper and cloth, treated and untreated in rolls, sheets or tape. Write for full information upon materials you need.

## ELECTRIC SOLDERING IRON:

Equipped with cartridge type heating unit with nickel-silver case. Tips, renewable, screw over case. Working heat in 3 3/4 minutes. Three types, light, intermittent and continuous service. Made for 115-230 volts, 75 to 350 watts for 3/8" to 1 1/4" dia. tips.



Electric Soldering Iron



# GENERAL ELECTRIC COMPANY

## PLASTICS—TEXTOLITE, CETEC AND FABROIL:

The Plastics Department of the General Electric Company manufactures a complete line of "Textolite" hot molded materials, and "Cetec" cold molded materials for all applications to industry and for general purpose.

**Fabroil:** The original non-metallic gear material in which cotton fibre is used as a base. Fabroil gears and gear blanks are composed of unwoven cotton fabric held under high compression by metal shrouds. Of all non-metallic gear material, it is the strongest, most enduring and quietest. For further information, write for publication *GEA-937B*.

## THRUSTORS—SOLENOIDS:

The Thrustor, an electro-hydraulic device in ten sizes for producing a thrust of 50 to 3200 lb. with a stroke of 2 to 16 inches. Smooth, dependable action for operation of clutches, brakes, valves, doors, conveyors, etc.

For lighter work there are A.C. or D.C. solenoids for pushing or pulling—long stroke—uniform power—an ounce or two to several pounds. Thruster operated valves for pipe sizes 1" to 10" are also available. *Bulletins GEA-1262, 1614, 1569.*



CR9504  
Thrustor

## G-E ARC WELDING EQUIPMENT:

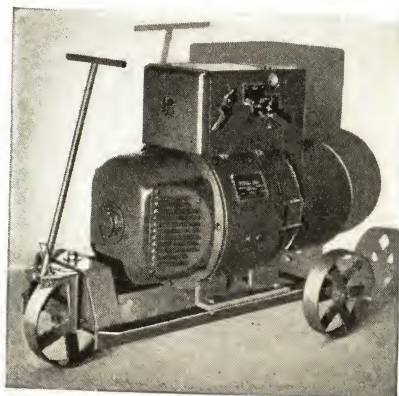
G-E welding equipment is available to meet practically every condition where it is possible to join metals by means of the electric arc.

**Type WD Single-Operator Constant Energy Sets:** Furnish power to one operator for metallic electrode welding. For all classes of work ordinarily found in industrial plants and railroad shops. Generator self-excited, inherently regulated, built in 100, 200, 300, 400 and 600 ampere sizes, at 40 volts, 1 hr. 50 deg. C. rating. Furnished completely assembled and wired with standard A.C. or D.C. motors or for belt drive. Can be gas engine-driven. *Bulletins GEA-1440 and GEA-1543.*

**Multiple-Operator Constant Potential Sets:** Furnish power to number of operators for metallic or carbon electrode welding or carbon cutting. Self-excited, compound wound, deliver constant voltage to arc. Driven by any standard A.C. induction or synchronous, or D.C. motor. Built in 400 to 2500 ampere sizes at 60 volts, 1 hr. 50 deg. C. rating. *Bulletin GEA-569C.*

**Automatic Arc Welder:** For feeding continuous lengths of bare, lightly fluxed or heavily coated electrode into arc at such rate that welding conditions in the arc remain practically constant. Ideally suited for welding straight or circumferential seams of tanks and pipe. Recommended where quantity production warrants installation. *Bulletin GEA-1891.*

**Atomic-Hydrogen Arc Welding Equipment:** For hand or automatic welding on thin metals, or on metals and alloys hitherto considered unweldable. Most intense source of welding heat available. Prevents formation of oxides. Welds made at high speed and of highest quality. *Bulletin GEA-823D.*



Type WD Arc Welder

**Type AW Resistor Welding Sets:** Operate direct from constant potential source. Sizes: 400-150 volts, 200-300 amperes (weight, 180 lbs.); 400-650 volts, 150-200 amperes (weight, 200 lbs.); 200-275 volts, 150-200 amperes (weight, 65 lbs.). *Bulletin GEA-1031B.*

**Welding Electrodes:**  
**Type A:** For cast iron welding—repairing machine bases, cylinder blocks, crankcases, etc.

**Type B:** For automatic welding black or galvanized iron tanks, pipes, etc.

**Type F:** For general purpose welding—machine bases, cast steel—general fabrication.

**Type H:** For speed welding—automatic—automobile parts, tanks, pipes.

**Type I:** For high carbon deposits—contains 0.85% to 1.10% carbon.

**Type L:** For structural steel welding.

**Type M:** For close-grained welds and deep penetration—building up worn shafts, fabricating light gauge metals, etc.

**Type O:** For Medium Carbon deposits—contains 0.55% to 0.70% carbon and 0.85% to 1.10% manganese.

**Type W-20:** For shielded-arc flat, vertical and overhead welding. Good in difficult positions.

**Type W-22:** For shielded-arc high quality (Class I) welding in all positions.

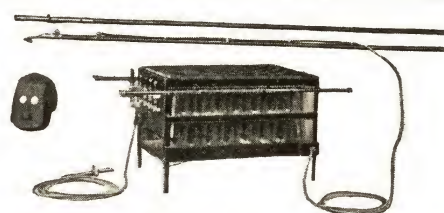
**Type W-23:** For highest quality and speed shielded-arc flat welding.

**Type W-84:** Nickel Manganese, bare, for reclamation of worn parts.

**Type W-85:** Nickel Manganese, coated, for reclamation of worn parts.

**Type W-90:** For shielded-arc surfacing, building up battered rail ends, etc.

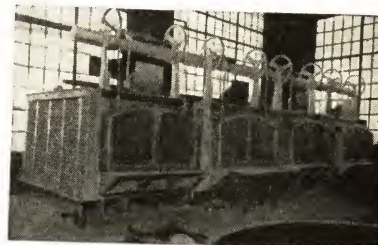
Send for *Bulletin GEA-1546.*



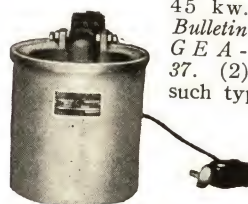
300-Ampere, G-E Type AW Resistor Arc Welder

## G-E ELECTRIC FURNACES:

G-E Direct-heat Electric Furnaces are classified in two groups: (1) Smaller stock types, completely erected and shipped ready to install. Automatic temperature control, up to 1850 deg. F. For operation on 110 and 220 volts D.C. or A.C., single and 3-phase; connected load up to 45 kw.



Battery of Four Box-Type Furnaces for General Heat Treating



Electric Metal Melting Pot

*Bulletin GEA-37.* (2) Large production furnaces including as elevator, car bottom, conveyor, rotary hearth, pit, bell and box types. Custom-built, for operation on same voltages as smaller stock models but for connected load up to 500 kw. or more *Bulletin GEA-1146A.*

## ELECTRIC OVEN EQUIPMENT:

G-E industrial oven heaters have an extreme temperature range up to about 1150 deg. F., and within this limit most of the industrial applications can be successfully made. There are two classes: (1) For work requiring oven temperatures up to 750 deg. F.; sizes, 110 volt, 2.5 and 3.8 kw. (2) For work requiring oven temperatures from 750 deg. F. to 1150 deg. F.; sizes, 110 volt, 3.8 kw.

Complete data are required for recommendations or quotations. Consult nearest G-E Sales Office.

## OTHER EQUIPMENT:

For information on other industrial heating units and devices such as cast-in hotplates, metal-melting pots, glue-pots, air heaters, compound melting pots, soldering irons, control equipment for industrial heating devices, etc., write for descriptive *Catalog GEA-1520B.*



# GOULDS PUMPS, INCORPORATED

Established 1848

## SENECA FALLS, NEW YORK

*Pumps for Every Service Hydroil Oil Purifiers*

### BRANCH OFFICES

NEW YORK, N. Y.  
BOSTON, MASS.

PHILADELPHIA, PA.  
CHICAGO, ILL.

TULSA, OKLA.  
ATLANTA, GA.

HOUSTON, TEXAS  
PITTSBURGH, PA.

Representatives in All Other Principal Cities

A few of the most popular Goulds Pumps, typical of our entire line, are shown on this page. There is a Goulds pump for practically every pumping service. Inquiries about any pumping installation gladly answered, and proper recommendations offered without obligating you.

Goulds also manufacture a complete line of oil purifiers. HYDROIL purifiers for the purification of fuel, lubricating, turbine and insulating oils of all types, have been accepted as standard in industry for years.

### CLOSE-COUPLED MOTOR-CENTRIFUGAL PUMPING UNITS

Figs. 3557-3558

A compact, low cost and efficient centrifugal pumping unit with a capacity range up to 1000 G.P.M. Heads range from 10 ft. up to 290 ft. Pumps are built in sizes  $\frac{3}{4}$  to 4 in. For general pumping service in industrial plants, offices and apartment buildings, green-houses, refineries, cold storage plants—in fact, its application is universal. For any installation where an inexpensive yet efficient and dependable unit is required, a Goulds Close-Coupled unit will give years of trouble-free service.

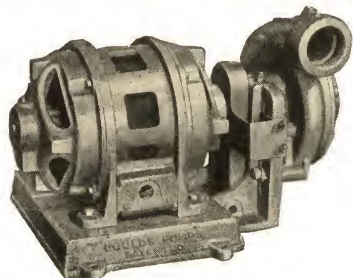


Fig. 3557-3558

### FLEXI-UNIT PUMPS

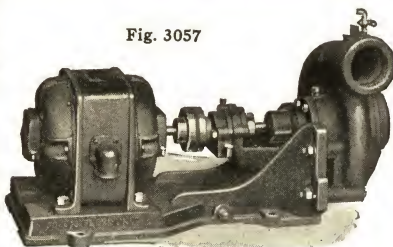
Figs. 3057-58, 3357-58, 3157-58, 3307-08 and 3159

One and two-stage, open impeller centrifugal pumps, with a range of capacities and a flexibility which make them adaptable to a wide variety of services. Furnished with single or double ball bearing shaft drive mountings. Bedplates will mount motors from  $\frac{1}{4}$  to 50 H.P. Sizes 1 to 8 in. Capacities 10 to 4500 gallons per minute. Heads up to 350 ft. Individually engineered. Interchangeable parts. Immediate shipments made from local stocks.

Also built in two-stage pumps—Figs. 3357-3358.

Capacities: 10 to 4500 G.P.M. Heads to 350 ft.

Fig. 3057



### FIGS. 3065 TO 3095 CENTRIFUGAL PUMPS

The pumps comprising this line, Figs. 3065, 3075, 3085 and 3095, have a wide range of capacities and heads.

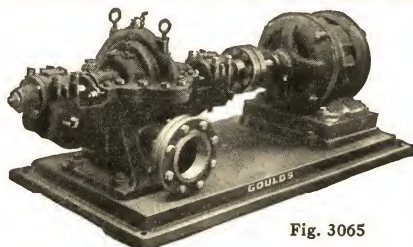


Fig. 3065

Pumps are single stage, double suction, babbitt bearing type with ring oil lubrication.

Adapted for drive by belt, motor, turbine or gasoline engine.

Four constructions: Standard Fitted, Bronze Fitted, All Iron and All Bronze.

Built in sizes from 2 to 12 in. Capacities from 40 to 7300 G.P.M. Heads up to 300 ft.

### FIGS. 3450 TO 3480 BALL BEARING CENTRIFUGAL PUMPS

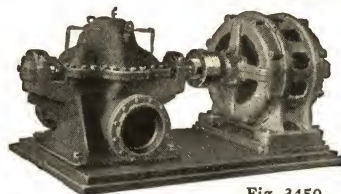


Fig. 3450

The pumps in this group were developed to meet the need for high grade Centrifugal pumps with a wide range of capacities, high heads and high efficiencies, at medium and high speeds. Fig. 3450 is a double-suction impeller pump, and is built in five sizes—2 to 16 in. Fig. 3470—a single-suction impeller pump—is made in 3 in. size only. Fig. 3480 is a double-suction impeller pump built in  $1\frac{1}{2}$  and  $2\frac{1}{2}$  in. sizes.

All of these pumps are ball bearing and single stage. Made in four constructions: Standard Fitted, Bronze Fitted, All Iron, and All Bronze.

Capacity range—15 to 15,000 G.P.M. Heads up to 625 ft.

### FIG. 3330 MULTI-STAGE CENTRIFUGAL PUMP

A pump designed to handle large volumes of liquid at high heads.

Special water passages give free flow of water from suction to discharge without abrupt turns.

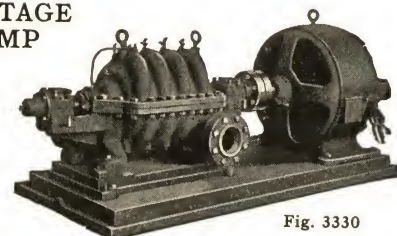


Fig. 3330

Simple construction. Remove upper half of casing and entire pump is exposed for examination.

### CENTRIFUGAL PUMP FOR THICK LIQUIDS

Fig. 3105: Designed primarily for the paper industry handling ground wood, sulphite soda, kraft and rag stock up to  $5\frac{1}{2}$  per cent consistency. Will also handle other thick liquids. Has two-vane, open type, non-clogging impeller.

Built in 4, 6 and 8 in. sizes; for capacities up to 3500 G.P.M. Heads up to 180 ft. Write for *Bulletin 206*.

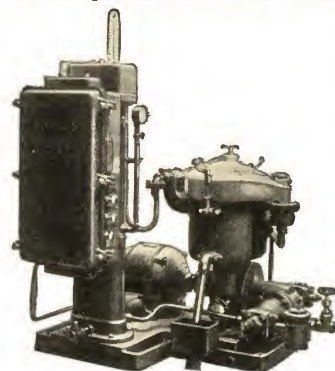
### TRIPLEX PLUNGER PUMPS

Single-acting plunger type. For general water supply, municipal waterworks, boiler feeding, mine pumping, irrigation and other uses. Many of these pumps have been giving satisfactory service for twenty and thirty years.

Built in capacities from 2 to 625 G.P.M. For working pressures up to 7500 lbs.

### HYDROIL PURIFIERS

Goulds HYDROIL Centrifugal Purifiers are recommended for the purification of all lubricating, turbine, fuel, insulating and industrial oils; as well as the purification or clarification of liquids in industrial process work. Units are built in a complete range of sizes to meet all requirements. Furnished either with or without heater units or filter attachments, depending on the nature of the work. Goulds HYDROILS have many exclusive features. Write for complete information.



Sizes 10 to 75. Capacities 30 to 600 gallons per hour.

Mechanical Catalog (1934-35)



## GOETZE GASKET & PACKING COMPANY, INC.

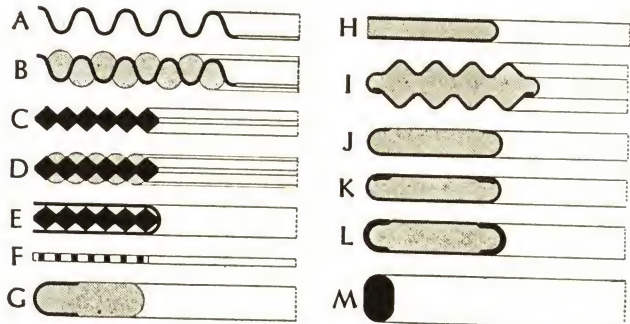
34 ALLEN AVE., NEW BRUNSWICK, N. J.

### PRODUCTS:

Standard and custom-made metallic and composition gaskets, sheet packing and valve discs.

This company has for 45 years concentrated its efforts upon problems involving fluid and pressure tightness at joints and connections, has originated many standard gasket types and is qualified to meet every gasket requirement.

The name Goetze on gaskets and packing is the stamp of exacting care in manufacture, rigid inspection and uniformly fine quality—all assuring high economy and efficiency in service.



### POPULAR GOETZE GASKET CONSTRUCTIONS

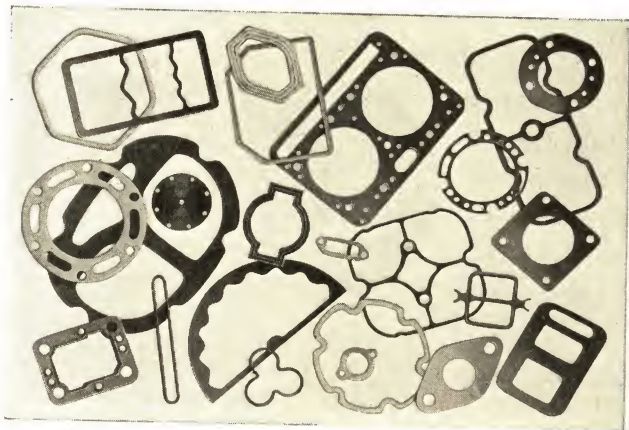
Together the above designs offer wide selection for any pressure, temperature, vibration, rough surface, resistance to erosive and corrosive conditions and for protecting the fluid handled from contamination. These designs can be furnished with any desirable filler and in copper, Armco Iron, stainless steel, Monel Metal, aluminum or other metal. The material combinations and sizes in greatest demand are carried in stock in large quantities, and others can be made up on short notice.

**Goetze Boiler Gaskets:** All shapes and desirable construction types. Those for popular makes of boilers carried in stock.

**Heat Exchanger Gaskets:** Made to any plain or intricate shape.

**Goetze Drum-Plug Gaskets:** Thoroughly tight against leakage and evaporation. No shellacing or great force necessary in setting. Standard in  $\frac{3}{4}$ ,  $1\frac{1}{2}$  and 2 in. sizes in every desirable material.

**Goetze Valve Discs:** Asbestos and steel rings encased in copper, Monel Metal or stainless steel shell. Sealed against disc holder by asbestos top ring. Resilient, durable and excellent for uninterrupted service. Valve sizes  $\frac{1}{4}$  to 12 in.



Typical of the Many Shapes of Gaskets  
Made to Order and Delivered on Short Notice

**Goetzerit Sheet Packing:** For general service. Long-fibre asbestos impregnated with a composition which increases tensile strength and retains pliability, flexibility and resiliency. 50-In. x 50-in. sheets,  $\frac{3}{32}$ ,  $\frac{1}{16}$  or  $\frac{1}{8}$  in. thick or cut into gaskets.

### LITERATURE, ENGINEERING SERVICE:

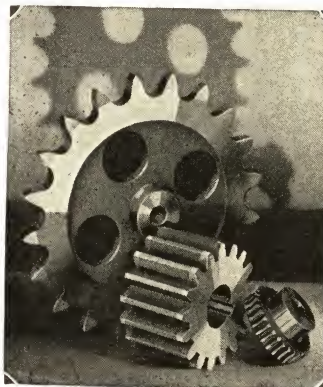
Prospective customers having design and operating problems should get our literature and free Engineering Advice.

Mechanical Catalog (1934-35)

## GRANT GEAR WORKS

SECOND AND B STREETS, BOSTON, MASS.

*Manufacturers of Standardized Cut Gears, Special Cut Gears, Speed Reducers, Silent and Roller Chain Drives*



### PRODUCTS:

Spur Gears.  
Bevel Gears.  
Miter Gears.  
Roller Chain Drives.  
Silent Chain Drives.  
Spiral Gears.

Intermittent Gears and Racks, cut in steel, brass and cast iron.

Worms and Worm Gears.

Pinions of rawhide and all bakelite material.

Block and Ladder Chains and Sprockets.

All types of Speed Reducers.

### PUBLICATIONS:

*Grant Gear Catalog* is complete. It contains useful information. It will be sent to you promptly upon request.



### CUT GEARS:

For over fifty years we have produced gears for all kinds of machinery, using improved gear-cutting machinery to insure greatest accuracy and economy. We not only carry in stock for prompt shipment almost any gear, but we have



them or can supply them in quantities to suit requirements, ranging from a mill's repair needs to machinery manufacturers' yearly production.

We make a specialty of rush breakdown jobs.

### SPEED REDUCERS:

We manufacture all types of Speed Reducers for Parallel shafts or right-angle drives.

Worm on top.

Worm on bottom.

Worm Gear shaft vertical.

Double Worm Gear.

Single Helical Gear.

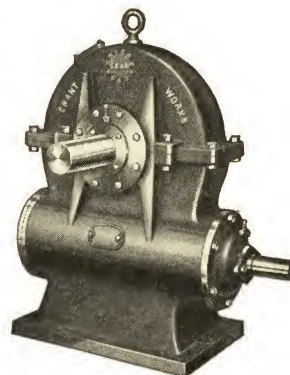
Double Helical Gear.

Compound Helical and Worm Gear.

Bevel or Miter Gear.

Ratios 1-1 to 5000-1.

Horse Powers  $1/50$  to 50.





# THE GWILLIAM COMPANY

360 FURMAN STREET, BROOKLYN, N. Y.

*Ball and Roller Bearings*



## PRODUCTS

BALL THRUST BEARINGS WITH FLAT RACES.  
BALL THRUST BEARINGS, WITH GROOVED RACES.  
ROLLER THRUST BEARINGS. JOURNAL ROLLER BEARINGS.  
BOWDEN CONTROL WIRE.

## BEARINGS CARRIED IN STOCK

We endeavor to maintain a representative stock of a large number of sizes in the various types for emergency and maintenance requirements.

## SERVICE AND CATALOG

In addition to the Standard dimension bearings listed on these pages we are prepared to furnish intermediate and larger sizes, made to order in any quantity, ONE BEARING—or ONE THOUSAND, catalog sent upon request. Send dimensioned sketch or old bearing as sample for quotation.

## STANDARD DIMENSIONS Applying to the Four Types Illustrated Below

Bearing No. (See Note)	Shaft Diameter	Outside Diameter	Thickness
5	$\frac{3}{4}$	1 $\frac{1}{8}$	$\frac{5}{8}$
6	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
7	$\frac{7}{8}$	1 $\frac{1}{8}$	$\frac{5}{8}$
8	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
9	1	1 $\frac{3}{8}$	$\frac{5}{8}$
10	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
11	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
12	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
13	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
14	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
15	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
16	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
17	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
18	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
19	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
20	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
21	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
22	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
23	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
24	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
25	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
26	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
27	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
28	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
29	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
30	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
31	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
32	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
33	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
34	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
35	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
36	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
37	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
38	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
39	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
40	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
41	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
42	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
43	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
44	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$
45	$\frac{1}{2}$	1 $\frac{1}{8}$	$\frac{5}{8}$

Intermediate and larger sizes made to order, one or one thousand.



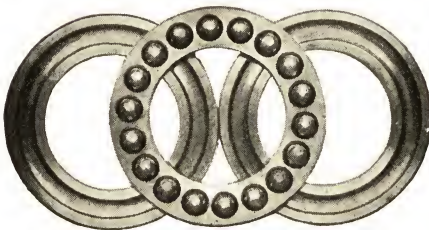
Type PH

Ball Thrust Bearings with Outside Retaining Band, Type PH: For heavy loads at slow or moderate speeds. No cage or separator is used, permitting the use of the maximum number of balls. The band holds the parts together as a unit.

Ball Thrust Bearings, Flat Race, Type TC: Suitable for light loads at moderate speeds. The balls are staggered or placed in spirals to distribute the load over the maximum surface of the race to prevent tracking.



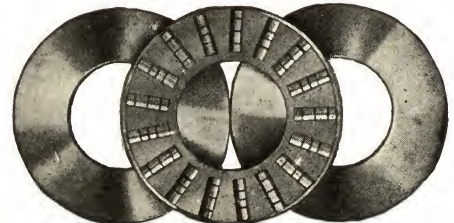
Type TC



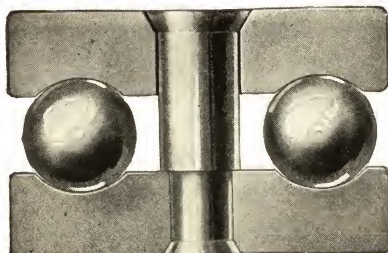
Type GB

Ball Thrust Bearings, Grooved Race, Type GB: Suitable for higher speeds and greater loads than the flat race type.

Roller Thrust Bearings, Type RT: This type of bearing is especially suited for extremely heavy loads at slow speeds.



Type RT

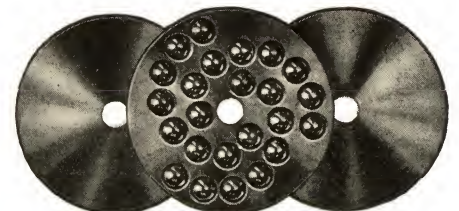


Type BSR

## STEP BEARINGS

Step bearings are principally used at the ends of vertical shafts and consist of hardened and ground flat steel plates and bronze retainers containing the balls; usually made on order for any size shaft.

May also be made with grooved races and to special design for heavy duty.

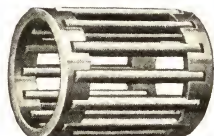


Type BS

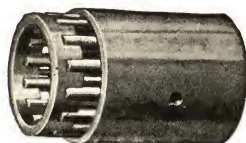


## JOURNAL ROLLER BEARINGS

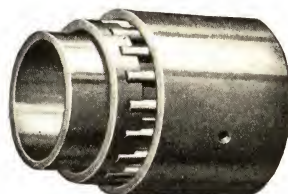
Journal Roller Bearings are designed for radial loads only and made in three distinct types, as illustrated below, each of which may be used as a complete unit, depending upon the particular application.



Type JR  
Roller Cage



Type JRC  
with Outer Casing



Type JRCS  
with Outer Casings  
and Inner Sleeve

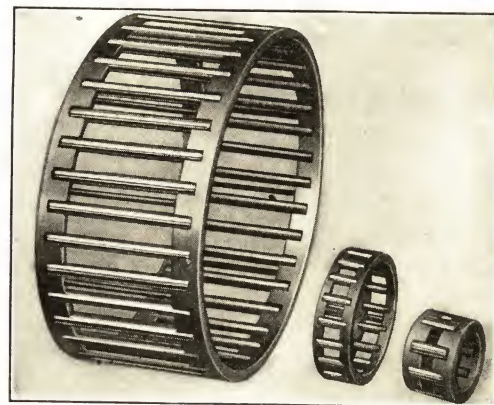
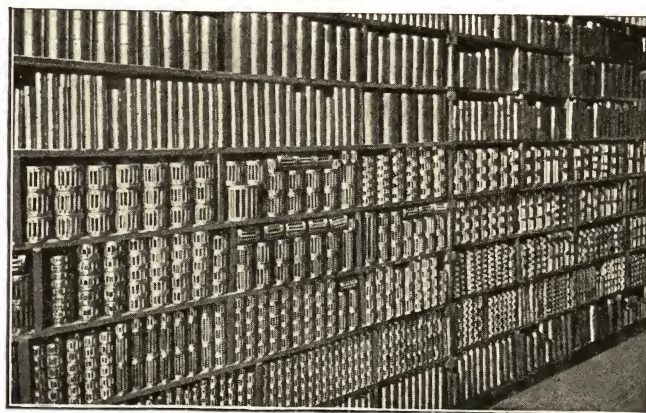
Journal Roller Bearings are made in standard sizes, from  $\frac{1}{2}$ " shaft diameter up. These standard sizes developed as a result of years of study and experience are recommended for use where practical.

Special bearings made to order.

The Rollers are solid, made of chrome alloy steel, properly hardened and accurately ground. The rollers are separated and held in place by end rings, which are correctly formed to properly space the rollers. The end rings are held firmly together by stay rods.

The casings and sleeves are made of Special Alloy Steel, machined, hardened and accurately ground. Seamless Steel Tubings being used for small sizes and weldless forgings for larger sizes.

Housings should be accurately bored and provisions made for lubrication, through oil holes provided in the casings.

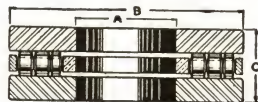


## ROLLER THRUST BEARINGS

Roller Thrust Bearings are especially adapted for heavy loads at slow or moderate speeds.

The complete bearing illustrated consists of two hardened and ground steel plates between which is a bronze cage retaining the steel rollers.

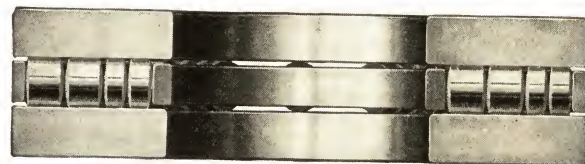
The rollers are straight (not tapered), hardened and ground, made in short sections to permit turning readily.



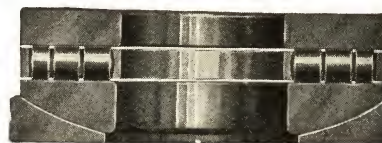
ROLLER THRUST BEARINGS  
HEAVY SERIES

Bearing No.	"A" Shaft Diam., In.	"B" Outside Diam., In.	"C" Width Over- All, In.	Diam. Rollers, In.
RT 82	2	6	1 3/8	3/4
RT 83	2 1/2	7	1 3/8	7/8
RT 84	2 1/2	8	1 3/8	7/8
RT 85	3	6	1 3/8	7/8
RT 86	3	7	1 3/8	7/8
RT 87	3	8	1 3/8	7/8
RT 88	3	9	1 3/8	7/8
RT 89	4	7	1 3/8	7/8
RT 90	4	8	1 3/8	7/8
RT 91	4	9	1 3/8	7/8
RT 92	4	10	1 3/8	7/8
RT 93	5	8	1 3/8	7/8
RT 94	5	9	1 3/8	7/8
RT 95	5	10	2	7/8
RT 96	5	11	2 1/4	7/8
RT 97	5	12	2 1/2	7/8
RT 98	6	9	2 1/2	7/8
RT 99	6	10	2 1/2	7/8
RT 100	6	11	2 1/2	7/8
RT 101	6	12	2 1/2	7/8
RT 102	7	10	2 1/2	7/8
RT 103	7	11	2 1/2	7/8
RT 104	7	12	2 1/2	7/8
RT 105	7	14	3	1
RT 106	8	12	3	1
RT 107	8	14	3	1
RT 108	8	16	3	1
RT 109	10	16	3	1
RT 110	10	18	3 3/4	1 1/4
RT 111	10	20	3 3/4	1 1/4
RT 112	12	18	3 3/4	1 1/4
RT 113	12	20	3 3/4	1 1/4
RT 114	12	24	4 1/2	1 1/2

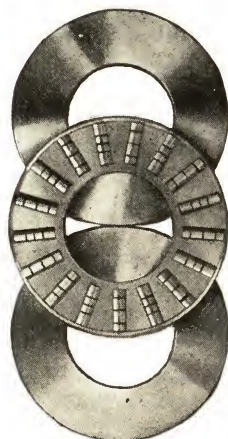
Intermediate and larger sizes made to order, one or one thousand.



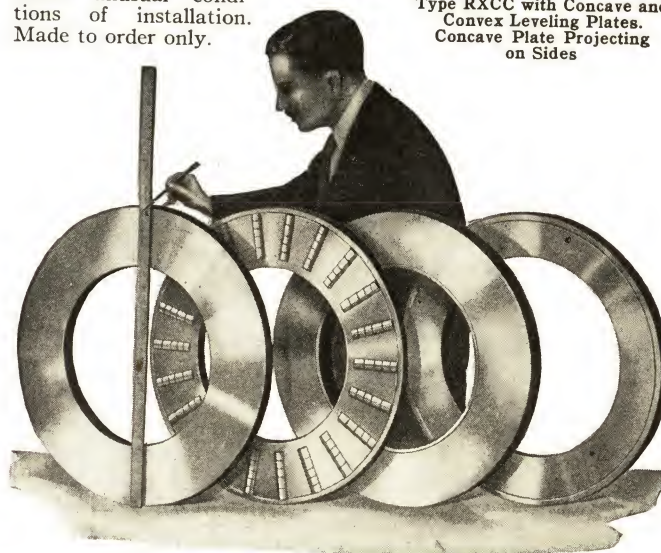
Type RT



Type RXCC with Concave and  
Convex Leveling Plates.  
Concave Plate Projecting  
on Sides



Heavy Series





## GRANGER MACHINERY CORP.

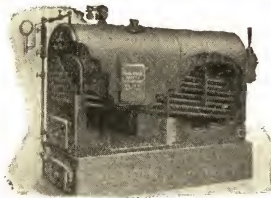
Established 1893

13 PARK ROW, NEW YORK, N. Y.

Power Plant Machinery

### "OSWEGO" WATER TUBE BOILERS:

This boiler is of the self-contained, internally fired, water tube type with straight inclined water tubes connecting front and rear water spaces. Inner and outer shells form a complete water jacket surrounding the fire which, with the tubes, absorb the radiated heat. *It occupies the smallest space per H. P. of any boiler built.* Maximum fuel economy is evidenced in the design. We guarantee an evaporation of 10 to 11 lbs. of water per lb. of combustible. Built in sizes from 50 H. P. to 300 H. P., both Type A for anthracite coal and Type B with down draft furnace for bituminous coal. *Bulletin C-2* is a complete catalog. Special designs for oil and gas fuels.



### HIGH PRESSURE TYPE "A" "OSWEGO" INTERNALLY FIRED WATER-TUBE BOILERS:

Dimensions of Boilers Do Not Include Rivet Heads or Flanges  
Horse power ratings subject to variation in proportion to boiler heating surfaces

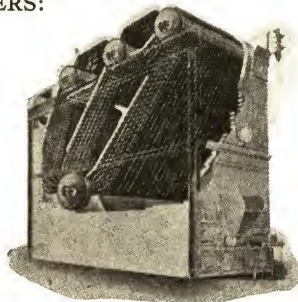
Cat. No.	H. P.	Width	Length	Total Height	Height, Base	Height, Water-line	Dia., Smoke Flue	Grate Surface, Sq. Ft.
8	50	4'2"	9'2"	7'2"	1'5"	6'1"	21"	17
9	60	4'2"	9'10"	7'6"	1'5"	6'3"	22"	18
10	65	4'2"	10'6"	7'7"	1'6"	6'4"	23"	18
11	70	4'2"	11'0"	7'7"	1'6"	6'4"	23"	19
12	75	4'2"	11'4"	7'7"	1'6"	6'4"	23"	19
13	85	4'2"	11'4"	7'11"	1'6"	6'7"	25"	21
14	90	4'10"	11'6"	8'4"	1'8"	6'10"	26"	25
15	100	4'10"	11'6"	8'7"	1'8"	7'1"	28"	26
16	110	4'10"	13'0"	8'7"	1'8"	7'1"	30"	29
17	125	4'10"	13'0"	8'8"	1'8"	7'2"	30"	29
18	135	5'0"	13'0"	9'7"	1'8"	7'11"	34"	31
19	150	5'0"	13'0"	9'11"	1'8"	8'3"	34"	31
20	175	5'0"	14'0"	9'11"	1'8"	8'3"	34"	31
21	200	5'9"	14'0"	10'3"	2'0"	8'7"	37"	37
22	225	5'9"	15'0"	10'7"	2'0"	8'11"	39"	40
23	250	6'11"	15'0"	10'9"	2'0"	8'11"	40"	48
24	300	6'11"	18'0"	10'9"	2'0"	8'11"	42"	57

### BRICK SET WATER TUBE BOILERS:

Cross Drum—Longitudinal Drum and Bent Tube types in all sizes.

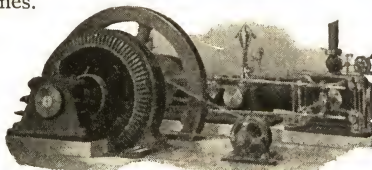
### FIRE TUBE BOILERS:

Scotch Marine, Return Tubular, Vertical, Locomotive and Firebox types.



### STEAM ENGINES AND TURBINES:

Four - valve - Unaflo - Side-valve and Automatic Engines. Steam Turbines with Generators or Pumps.

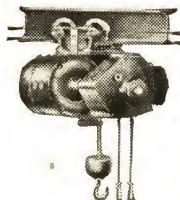


### TRAVELING CRANES:

Hoists and Monorail Systems, Hand Power and Electric.

### MILWAUKEE AIR POWER WATER PUMPING SYSTEMS:

Complete system for domestic service. No water in storage. Entirely automatic.



### UNITED STATES LIGHTING PLANTS:

$\frac{3}{4}$  kw. to 25 kw. for both land and marine service. Direct connected to gas engines.

### COMPLETE STEAM, OIL AND ELECTRIC INSTALLATIONS:

We are contractors for complete steam, oil and electric installations. We specialize in oil conversion jobs with guaranteed results. Our equipment, facilities and experience enable us to give competent service on the entire power plant or any part thereof.

## HAZARD WIRE ROPE COMPANY

WILKES-BARRE, PENNSYLVANIA

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CHICAGO, ILL. . . . . 400 W. Madison St.  
DENVER, COL. . . . . 2125 Blake St.  
FORT WORTH, TEXAS . . . . . 1112 Fair Bldg.  
LOS ANGELES, CAL. . . . . 841 Petroleum Securities Bldg.  
NEW YORK, N. Y. . . . . 230 Park Ave.  
PHILADELPHIA, PA. . . . . 501 Elverson Bldg.  
PITTSBURGH, PA. . . . . 701 American Bank Bldg.  
SAN FRANCISCO, CAL. . . . . 425 Second St.  
TACOMA, WASH. . . . . 1936 Pacific Ave.

### PRODUCTS



Wire rope in all grades, constructions and lays.

Wire Rope Fittings.

Lay-Set Preformed Wire Rope.

"Korodless" Wire Rope.

Hazard Wire Rope (non-preformed).

HAZARD LAY-SET PREFORMED WIRE ROPE.

### THE PREFORMED PRINCIPLE

In Lay-Set Preformed wire rope, strands and wires are preformed to the exact helical shape they assume in the finished rope. This eliminates internal stress always present in non-preformed rope. Lay-Set lasts longer, is easier to handle, resists kinking, high and low stranding, requires no seizing.



Note the Helical Shape of the Strands and Wires

### LAY-SET COMES IN ALL LAYS, GRADES AND CONSTRUCTIONS

The name "LAY-SET" is not the name of a lay but is a process of manufacture whereby strands and wires are PREformed. We can furnish LAY-SET in all constructions, grades, sizes and lays.

### "KORODLESS" WIRE ROPE

Hazard "Korodless" Wire Rope made of Stainless Steel is fully resistant to practically all corrosion, fumes, acids, alkalis, salts and excessive heat. Produced from chrome nickel alloy steel by Hazard—America's oldest wire rope manufacturer.

### HAZARD WIRE ROPE (non-preformed)

Hazard Wire Ropes have been well and favorably known for over 85 years during which time they have built up a valued reputation for quality in materials, workmanship and service. For the benefit of our customers the Hazard staff of experienced engineers will gladly advise on any rope problem. Please consult them.



# HARDINGE COMPANY, INC.

YORK, PA.

NEW YORK, N. Y., 122 East 42nd Street CHICAGO, ILL., 205 W. Wacker Drive  
SAN FRANCISCO, CAL., Hardinge-Western Co., 444 Market Street

## HARDINGE PRODUCTS:

Hardinge Conical Ball and Pebble Mills, Hardinge-Hadsel Mills, Coal Pulverizers, Rod Mills, Tube Mills, Batch Mills, Counter-Current Classifier, Air Classifying Mill, Constant Weight Feeder, Scrubbers, Thickeners, Clarifiers, Rotary Tubular Conveyors, Ruggles-Coles Dryers, Stone Screens, Material Distributors, Lime Kilns, Sanitation Equipment.

## GRINDING MILLS:

Conical Ball and Pebble Mills are used for grinding wet or dry, in open or in closed circuit, either for granular or fine products. Sizes range from 2 feet to 10 feet with capacities from a few pounds per hour to 50 tons per hour. *Bulletin No. 13 B.*

Tube mills for special problems are built in sizes from 4 to 8 feet in diameter with lengths from 10 to 22 feet. *Bulletin No. 18.*

The Conical Ended Rod Mill is recommended where a granular product ranging between 10 and 48 mesh is desired, with a minimum of fines, either grinding wet or dry. It is an excellent mixer of sand and lime for sand-lime brick. *Bulletin No. 25 A.*

The Hardinge Coal Pulverizer incorporates all the important features of a successful pulverized fuel unit—synchronized control of feed and product, absolute control of the fineness of fuel and continuous operation with low running costs. *Bulletin No. 13 B.*

## AIR SEPARATION:

For separation of finely ground materials, the Reverse Current Air Classifier, operating in conjunction with the Hardinge Mill, is a compact, self-contained unit of unusual efficiency. Any fineness up to 99% passing 325 mesh can be secured. *Bulletin No. 13 B.*

## CLASSIFIERS:

The Hardinge Counter-Current Classifier is a device used to separate relatively coarse from fine particles, using a liquid as the classifying medium.

The classifier is a slowly rotating drum, on the inner surface of which is located a screw flight attached to the drum, revolving with it. The material to be classified is fed in at one end above the pulp level, and as the classifier rotates, the coarse particles that settle out are moved forward by the screw flight and are turned over in their forward motion. The fines are washed back toward the overflow end by the wash water introduced at the sand discharge end. The classifier may be operated in closed circuit with any suitable type of grinding mill without the use of auxiliary conveyors or other equipment. *Bulletin No. 39.*

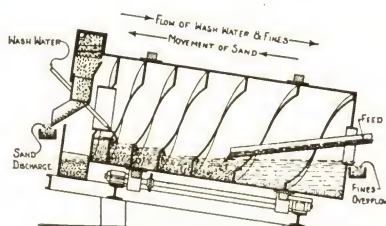
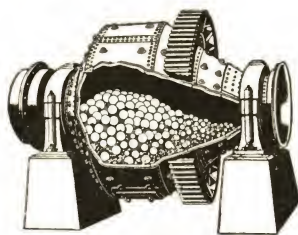
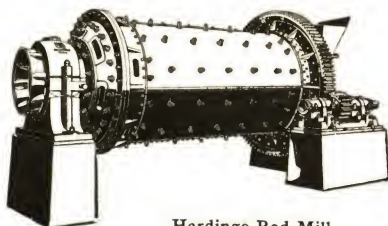


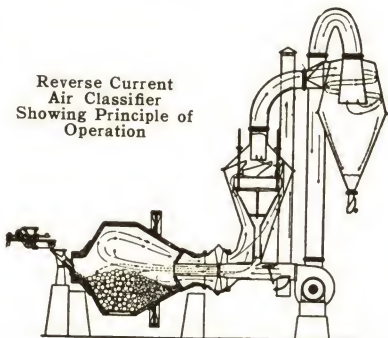
Diagram of Counter-Current Classifier Illustrating Principle of Operation



Conical Mill Showing Classification of Balls and Materials



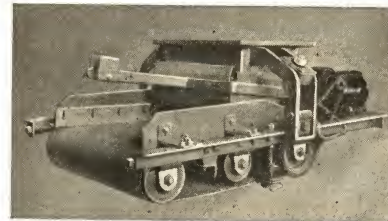
Hardinge Rod Mill



Reverse Current Air Classifier Showing Principle of Operation

## FEEDERS:

The Hardinge Constant Weight Feeder measures and feeds by weight instead of volume. It feeds coarse or fine materials without choking, and operates successfully with Crushers, slow and high speed Pulverizers, Dryers, Mixers, and like equipment. Capacities range from 1 pound an hour to 1000 tons an hour. *Bulletin No. 33 B.*

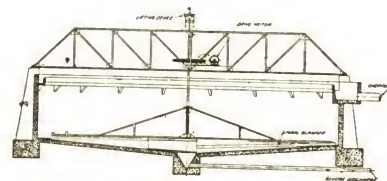


Hardinge Constant Weight Feeder

## THICKENERS, CLARIFIERS, SAND FILTERS:

The Hardinge Spiral Thickener and Clarifier is designed for the separation of mixtures of liquids and finely suspended matter. The distinctive feature of this machine is the Spiral Scraper. The mechanism can be operated very slowly, thereby causing a minimum of disturbance in the tank.

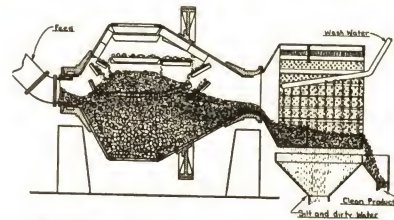
The sand filter is essentially the same mechanism as the Clarifier, except that it is provided with a sand filter bed. This machine is particularly applicable for "final clarification" problems, for operations where a crystal-clear liquid is desired. *Bulletins No. 30 and No. 31 A.*



Hardinge Spiral Thickener and Clarifier

## SCRUBBERS:

The Hardinge Conical Scrubber cleans by mass contact and natural displacement. This action removes dirt and silt without wear on the Scrubber. The classifying action of the cone holds back the large clay balls until properly disintegrated. Foreign materials, such as sticks, vegetation or large pieces of metal can do no harm. Power and water requirements are considerably less than other methods. Repair costs are practically nothing, since the material scrubs itself. *Bulletin No. 37.*



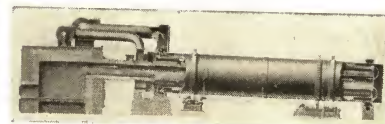
Hardinge Scrubber and Washing Screen

## DRYERS, KILNS AND COOLERS:

There are nine distinct types of Ruggles-Coles Double and Single Shell Rotary Dryers, designed for direct, indirect and steam heat in from four to ten sizes for each type. Also rotary and vertical kilns; air and water spray type coolers.

Class XA Dryer—The Ruggles-Coles Double-Shell, direct heat Dryer has the highest thermal efficiency, and consequently the lowest fuel consumption, of any rotary dryer manufactured.

Class XB Dryer—The Class XB Dryer is a double-shell indirect-heat rotary dryer designed to handle such materials as kaolin, chalk, whiting, china clay, pigments, fullers' earth, etc., which cannot be dried by direct heat on account of possible injury from the products of combustion. *Bulletin No. 16 B.*



"XB" Ruggles-Coles Dryer Showing Flow of Gases



# HARNISCHFEGER CORPORATION

Established 1884

4497 W. NATIONAL AVE., MILWAUKEE, WIS.

## BRANCH OFFICES

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HOBOKEN, N. J. . . . . 1714 Willow Ave.  
INDIANAPOLIS, IND., 305 Indiana Farm Bureau Bldg.

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KANSAS CITY, MO. . . . . 1615 W. 51st St.  
LOS ANGELES, CAL. . . . . 2025 Santa Fe Ave.  
MEMPHIS, TENN. . . . . 307 So. Front St.  
MINNEAPOLIS, MINN. . . . . 818 Lumber Exch.  
NEW YORK, N. Y. . . . . Empire State Bldg.

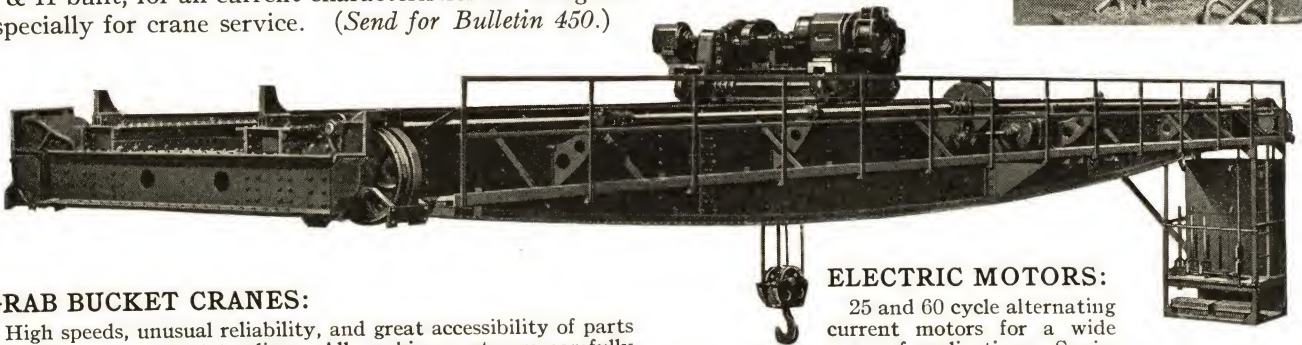
PHILADELPHIA, PA. . . . . Broad St. Station Bldg.  
PITTSBURGH, PA. . . . . Farmers Bank Bldg.  
ST. LOUIS, MO. . . . . Missouri Hotel  
SAN FRANCISCO, CAL. . . . . 82 Beale St.  
SEATTLE, WASH. . . . . 2911 First Avenue, South  
WASHINGTON, D. C. . . . . 7611 Georgia Ave.

Agents in All Principal Cities

"P & H", the Harnischfeger Corporation is the largest manufacturer of electric traveling cranes in America. More than 12,000 "P & H" and "Milwaukee" cranes have been put in service. P & H manufactures the equipment here listed in its entirety. From foundry to assembly shop, each step of production is subjected to rigorous control. This policy applies to electric motors and controls as well as to structural and mechanical parts.

## ELECTRIC TRAVELING CRANES:

Capacities from 5 tons to 350 tons in any required girder length. Standard and low headroom types. Designs for every material-handling service. Unusually sturdy construction plus careful machining of working parts and extensive use of special alloy steels assure slow depreciation and low maintenance costs. Minimum factor of safety of 5. Ball bearing motors, P & H built, for all current characteristics are designed especially for crane service. (Send for Bulletin 450.)



## GRAB BUCKET CRANES:

High speeds, unusual reliability, and great accessibility of parts make these cranes outstanding. All working parts are carefully protected from dirt and grit, hence long service is assured under the most rigorous conditions. Trolleys are built to handle buckets of practically any capacity. (Send for Bulletin No. 306.)

## P & H MILWAUKEE SINGLE LINE BUCKETS:

Capacities from  $\frac{1}{2}$  to  $2\frac{1}{2}$  yds. Can be hung on hook of any crane or hoist without change in reeving. Positive in action. (Send for Bulletin SL-2.)

## CRAWLER AND TRUCK CRANES:

Capacities from 3 to 50 tons. Boom lengths from 25 to 100 feet. Hoisting speeds from 150 to 191 feet per minute. Gasoline, Electric, or Diesel Power. (Send for Bulletin CC-1.)

## EXCAVATING MACHINERY:

P & H Excavators include a line of full revolving models ranging from  $\frac{3}{8}$  to 4 yds. capacity. Shovels, draglines, clamshell cranes, trench hoes, skimmer scoops, trenchers, back fillers, etc. Gas, Diesel, and Electric powered. Catalogs upon request.

## WELDING FIXTURES:

For increasing efficiency in the weldery by rapid handling of work and quick positioning for fast, effective welds. Structure to be welded can be rotated to proper position. Electrically operated. Capacities: 4000 and 8000 pounds. Will take structures up to 16 feet in length. (Send for Bulletin W-1.)

## P & H MILWAUKEE ELECTRIC HOISTS:

Capacities,  $\frac{1}{4}$  to 15 tons. Types of mounting: hook suspension, bolt suspension, base mounting, plain trolley, motor driven trolley, and swivel type motor driven trolley. Fast, simply operated by push button or pendant control, very sturdy. Motors dust and weatherproof. Working parts quickly accessible. (Send for Bulletin RH-1.)



## ELECTRIC MOTORS:

25 and 60 cycle alternating current motors for a wide range of applications. Squirrel cage motor ratings from  $\frac{1}{2}$  h.p., 600 r.p.m., to 125 h.p., 3600 r.p.m., and slip ring motors from 1 h.p., 900 r.p.m., to 75 h.p., 1800 r.p.m. Types include: weather-proof or splash-proof, totally enclosed and enclosed fan-cooled designs with horizontal or vertical shafts.



## P & H HANSEN ARC WELDERS:

100, 200, 300, 400, 600, 800 Amp. sizes. Portable and stationary models operating on either direct or alternating current. Gas engine driven models in stationary, portable, or tractor mountings. Noted for its deep penetration, its steady arc, simplicity of control, and freedom from troubles. (Send for Bulletin HW-3.)



# HAUCK MANUFACTURING COMPANY

Established in 1900

127-137 TENTH ST., BROOKLYN, N. Y.

Manufacturers of Gas and Oil Burners and Oil Burning Equipment

CHICAGO, ILL., 4659 W. Harrison St.

SAN FRANCISCO, CAL., 296 Second St.

## PRODUCTS:

HAUCK VENTURI OIL BURNERS, high pressure (steam or compressed air) and low pressure air (8 oz. to 2 lb. with two and three stages of atomization).

MICRO INCREMENT OIL REGULATING VALVES.

COMBINATION OIL AND GAS BURNERS.

GAS BURNERS, high and low pressure types.

TORCHES of all sizes for Heating and Repair Work in boiler shops, locomotive and car shops, machine and pipe shops, lighting powdered coal fires, etc.

CONCRETE HEATERS; ASPHALT, TAR and PITCH KETTLES; LEAD and BABBITT MELTING FURNACES; RIVET HEATING FORGES; THAWING OUTFITS; Weed Burners.

Also Foundry Equipments: Cupola Lighters, Ladle Heaters and Mould Dryers; Crucible Melting Furnaces.

## VENTURI LOW PRESSURE OIL BURNERS:

Made for two and three stages of atomization of all grades of fuel oil from 8° Baumé up, with low pressure air (from 8 oz. to 2 lb.) which is cheapest from the standpoint of first and operating cost without decreasing in any way the oil burning efficiency. The Hauck Venturi principle of atomization is used, resulting in the oil burning efficiencies listed above (see 1, 2, 3 and 4). Made in five sizes for two-stage atomization, *Bulletin No. 401*; and four sizes of three-stage atomization (single air connection), *Bulletin No. 402*. For use with preheated or recuperated air with or without automatic controls—four sizes of three-stage atomization (2 air connections), *Bulletin No. 403*. Air control registers furnished where necessary.

Let our extensive and varied experience assist with your oil burning problems.



Venturi Low Pressure Oil Burner  
Two-Stage Atomization

## VENTURI HIGH PRESSURE OIL BURNERS:

Highly efficient with compressed air or steam pressure at 30 lb. per sq. in. gauge and higher. Burn 19° Baumé and lighter fuels without heating and all heavier oils if preheated.

The fine atomization of the oil by the Hauck Venturi principle is responsible for uniform and intimate mixing of oil and air, resulting in high oil burning efficiencies. That means: (1) a cleaner and hotter flame; (2) instantaneous and trouble-free lighting—without smoke; (3) unusually easy control from low to medium and high oil burning capacities and vice versa; (4) a substantial saving in oil.

Adaptable to all phases of industrial heating and heat treating. Made in five sizes with and without air control registers. Special burners for small furnaces, ovens and rivet heating forges. Also five sizes of large capacity oil burners for large melting furnaces, rotary kilns and dryers, and two sizes of flat flame burners suited to firing boilers, etc., where a spreading flame is desired. Ask for *Bulletin No. 451* and submit your problems to us.



Venturi  
High Pressure Atomizer

## OIL BURNING EQUIPMENT:

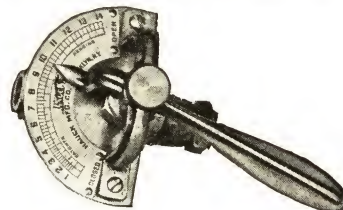
Turbo compressors, rotary oil pumps, fuel oil heaters and accessories, heavy duty single and duplex oil strainers, automatic safety oil shut-off valves, oil meters, etc. *Bulletin No. 703*.

## GAS BURNERS:

High and low pressure burners suitable for city gas, coke oven gas, water gas, natural gas, refinery gases, butane, propane, petroleum gas, and mixed gas.

## MICRO INCREMENT OIL REGULATING VALVES:

For the minute and positive regulation of any type oil burner, using any grade of fuel, tar not excepted. Operator can maintain required temperature and atmosphere at all times through fine adjustment of valve orifice and resetting by dial indicator. Saves fuel; improves quality of product; saves time in heating up and production; eliminates "fading away" of flame and "clogging troubles." Made in a wide range of sizes for any volume up to 650 gallons per hour of heavy oil and 1300 gallons per hour of light oil. Suitable for all operating pressures. Ask for *Bulletin No. 702*.

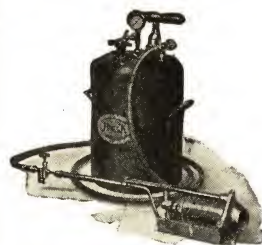


## ASPHALT, TAR AND PITCH KETTLES:

Burn kerosene or coal oil. Melt 50 gal. of asphalt in 25 minutes—continuous supply thereafter. Made in 50, 75, 100 and 150-gal. sizes—on legs or on steel or rubber-tired wheels. *Bulletin No. 652*.

## HAND PUMP TYPE TORCHES:

Recommended where compressed air is not available. Must be preheated—just like the ordinary plumber's torch. Burn kerosene or coal oil. Save time and labor in making all repairs requiring heat, such as straightening shafts, axles, frames, buckled plates, girders, etc.; bending pipes, rails; melting babbitt out of bearings, etc. When used for preheating in welding, saves oxygen and acetylene. Send for *Bulletin No. 151*, describing various single and double burner combinations.



Hand Pump Type Torch

## COMPRESSED AIR TYPE "SUCTION" TORCHES:

Listed by Underwriters' Laboratories, Inc., for use with compressed air from 40 lb. per sq. in. gauge and up. No pressure in the tank or oil hose. Burn fuel oil of 28° Baumé and up and all distillates. Used for heating and repair work as covered in detail above. Made in various single and double burner combinations. Ask for *Bulletin No. 301*.

Other compressed air type "pressure" torches to be used with crude and heavy fuel oils. Made in various single and double burner combinations. Ask for *Bulletin No. 251*. Also special burners for lighting powdered coal fires.

## LEAD AND BABBITT MELTING FURNACES:

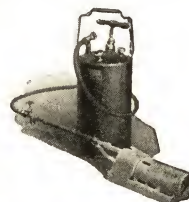
A combination of furnace and portable torch. Ideal for machine and repair shops. Made in different sizes—stationary and wheel types. Send for *Bulletin No. 101*.

## RIVET HEATING FORGES:

Operate with Venturi high pressure "suction type" burners—no pressure on the fuel oil or in the tank. Listed for safety in operation by Underwriters' Laboratories, Inc., Chicago. Made in 3 sizes for heating from 250 up to 500  $\frac{3}{4}$  x 3-in. rivets per hour. Write for *Bulletin No. 351*.

## THAWING OUTFITS:

Used by industrial plants, railroads and public utilities for thawing frozen coal hopper cars; thawing water pipes, switches; removing ice and snow from materials, etc. The speediest and most economical method of doing this work. Write for *Bulletin No. 1014*.



Thawing Outfit



# THE HAUSER-STANDER TANK CO.

AMMEN ST. AND SPRING GROVE AVE.,  
CINCINNATI, OHIO

## PRODUCTS:

Wooden tanks of every description, shape and size, made to the special order of the customer—no “in-stock” tanks carried at any time. We can furnish tanks lead-lined, rubber-lined or plain, and secured with iron, acid-resisting bronze, monel, copper, lead covered iron, galvanized iron rods, etc., depending upon your particular requirements.

We are prepared to furnish and erect Gravity Sprinkler Tanks and Towers to meet National or Factory Mutual requirements. Cypress, Redwood and Fir are commonly used with Cypress and Redwood being recommended for long life.



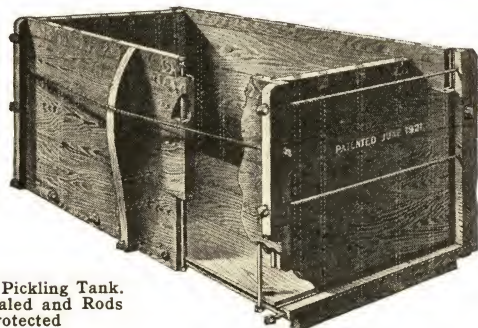
Gravity Sprinkler Tank and Tower  
to Meet National Factory Mutual  
Requirements

## ACID PICKLING TANKS:

We build both heavy and light acid pickling tanks. The heavy tanks may be either plain or plunger type. These tanks are rodded with monel metal, acid-resisting bronze and alloy steel.

Lighter pickling tanks, i.e., 2" and 3" material, are frequently lined with Rubber or with C.P. or anti-mony lead, burnt in. When not lined, rods of acid-resisting metal must be used.

The light pickling tanks are usually made of Cypress, whereas the heavy tanks are made of special Long Leaf Yellow Pine or Douglas Fir.

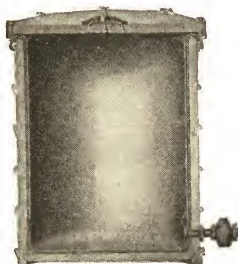


Patented Pickling Tank.  
Joints Sealed and Rods  
Protected

Plating tanks, etc., are frequently lined with pitch or asphalt.

## RUBBER-LINED TANKS:

We line both wood and steel tanks and other containers with rubber compounded to our special specifications. The rubber is applied over the entire inside of the tank by a special process. The tank may be provided with rubber-lined steel, hard rubber or Duriron outlet and pipe to convey the acid to and from the tank,

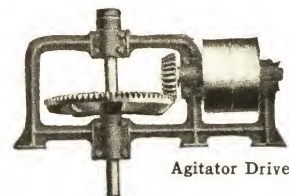


Rubber-Lined Tank for  
Muriatic Acid, Etc.

by which method the enormous expense of handling acid in carboys and the loss by carboy breakage is entirely eliminated. Acid pumps, etc., can be furnished.

## MATERIAL:

Thoroughly air-seasoned lumber of the best grade obtainable is used in our tanks. We carry a large stock of genuine Tidewater Red Cypress, California Redwood, Douglas Fir, Long Leaf Yellow Pine, Maple, Oak and other tank woods. Only the best grade of metals for hooping, rodding and lining tanks is used.



Agitator Drive



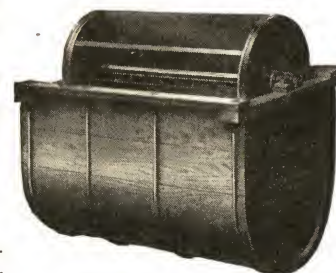
Filter Tank

## TESTS:

We completed recently an exhaustive series of laboratory tests on the action of many different kinds of wood. Thirty-eight chemical solutions were used. Of these solutions:

- 4 affected Long Leaf Yellow Pine.
- 7 affected Tidewater Red Cypress.
- 8 affected Douglas Fir.
- 13 affected Hard Maple.
- 15 affected White Oak.
- 22 affected Redwood.

Complete report regarding these tests in our new catalog.



Half Round Tank with or  
without Paddles

## CO-OPERATIVE SERVICE:

We maintain a department for the purpose of co-operating with engineers and chemists in solving their tank problems.

Let us give you the benefit of our experience—a period of over sixty years, the reason *We Win with Quality*.

## CATALOG:

We have recently issued a new catalog which is yours for the asking. See “Special Report,” pages 83 to 97, on “A Study of the Action of Various Chemicals upon Different Woods Used for Chemical Tanks.”



Pressure Vacuum Tank.  
No Metal Inside. Tested  
to 50 Lbs. Pressure



# THE HAYS CORPORATION

1042 E. EIGHTH ST., MICHIGAN CITY, INDIANA

*Manufacturers of Hays Combustion Instruments Since 1901*

Representatives in All Principal Cities

## PRODUCTS:

Dry Type Pointer Draft Gages; U-Tube, Direct Reading and Vernier Scale Draft Gages; Air Filter Gages; CO<sub>2</sub> and Draft Recorders; Flue Gas Analyzers (Orsats); Portable Combustion Test Sets; Draft Recorders; Boiler Panels; Ignition Velocity Meters; Portable Hand Operated Gas Calorimeters; Recording Gas Calorimeters.

## HAYS DRY TYPE POINTER GAGES:

For Draft, Pressure, Differential, in Wall, Flush Panel and Portable Cases.



Type V, 1 to 20 Scales



Type F,  
1 or 2 Pointers



Type J,  
1 or 2 Pointers

Introduced seven years ago Hays Dry Type (no liquids) Pointer Gages have revolutionized draft gage design. They are now offered in "B", "F", "J" and "V" type cases, as illustrated, in ranges between 1/10 inch water to 100 inches water, for draft, pressure and differential draft or pressure and for wall or flush panel mounting. Temperature and pressure units can also be incorporated. These Dry Type units are also offered in a full line of single and two unit Recorders, for either 8 inch or 10 inch charts.

The operating mechanism, consisting of a durable slack leather diaphragm and a phosphor-bronze spring, produces the smoothest and most definite action imaginable.

The leather used is four thicknesses of a special animal membrane tanned to retain the natural animal oil. It makes a tough, flexible, air-tight diaphragm which will last for many years. Avoiding the use of floats, liquids and tanks makes leveling unnecessary. Hays Pointer Gages work just as well on rolling ships as in stationary plants.

All Hays Pointer Gages are of simple design, beautifully finished. They are accurate and reliable. Calibration is permanent. Over 8000 in service in stationary and Marine plants. Write for Catalog PGA-32.



Type B,  
1 or 2 Pointers

The Type "B" Gage at right is furnished in portable, wall and flush cases. It is ideal for indicating resistance through air filters. Write for Bulletin 2000.

## HAYS LIQUID TYPE DRAFT GAGES:

We offer a complete line of Inclined Tube Gages for ranges between 1/2 inch water and 4 inches water, in portable and wall mounted styles. Also U-Tube (Manometer), Direct Reading Single and Multiple Tube and Vernier Scale Gages. Write for Bulletin 2003.



## HAYS CO<sub>2</sub> RECORDER-INDICATOR:

Hays Combustion Recorders for CO<sub>2</sub>, operating on the Orsat principle, are offered in a number of styles which combine either or both records of Over Fire Draft and Flue Gas Temperature on the same 10 inch chart with CO<sub>2</sub>. A CO<sub>2</sub> only (illustrated) or CO<sub>2</sub> and Draft Indication can be supplied in addition to the record. Hays Combustion Recorders can be remote mounted with the Analyzer section located up to 100 feet distant from the Recorder or Recorder-Indicator. This eliminates necessity for long gas lines, makes lag negligible and yet adds no electrical or mechanical transmitting devices, the standard Hays CO<sub>2</sub> Analyzer section being employed to transmit pneumatically. All Hays Combustion Meters are offered in either wall or flush panel cases.



Hays CO<sub>2</sub> Recorders employ a small stream of water which is first used to chill and precipitate out the sulphur mist and water present in flue gases and which would otherwise cause gas line trouble. Next it is used to continuously aspirate the flue gases to the machine. Then the same water is employed to operate the CO<sub>2</sub> Analyzer and automatically compensate for pressure and temperature of the gas sample. And before being wasted this water is used a fourth time to automatically level the caustic potash. ONLY THE HAYS CO<sub>2</sub> RECORDER COMPENSATES FOR ALL VARIABLES OF PRESSURE, TEMPERATURE AND LIQUID LEVEL. This assures you of years of accurate, dependable service. Write for Catalog RA-34. Should you require an indicating machine only write for Bulletin RIE-32.

## HAYS FLUE GAS ANALYZER (ORSAT):

For CO<sub>2</sub> Only, Oxygen Only or for CO<sub>2</sub>, O<sub>2</sub> and CO:

Monel metal needle valves, easily renewable pure nickel seats, hard rubber chemical bottles with threaded neck, molded glass absorption pipettes and our patented steel wool method of absorption distinguish this latest model Hays Orsat. Can be completely disassembled with a pliers and screw-driver in two minutes.

Offered in 14 ranges in 50 cc. and 100 cc. sizes. A burette for every purpose. Special burettes made to order.

Over 30,000 in service.

Write for Catalog TSE-33.



Analyzer for CO<sub>2</sub>, O<sub>2</sub> and CO

## HAYS PORTABLE COMBUSTION TEST SET:

At the left is illustrated our TS-1011 Test Set comprising carrying case, Dry Type Draft Gage, Thermometer and CO<sub>2</sub>, O<sub>2</sub> and CO Flue Gas Analyzer. We offer fifty combinations of Combustion Test Sets. Write for Catalog TSE-33 and Bulletin 2009.





# THE HAYWARD COMPANY

40-46 DEY STREET, NEW YORK, N. Y.

## AGENCIES

CHICAGO, ILL., R. W. Hawkins & Co., 122 So. Michigan Ave.  
SAN FRANCISCO, CAL., Percy Keatinge, 681 Market St.

## PRODUCTS AND SERVICE:

Clam Shell Buckets; Electric Motor Clam Shell Buckets; Orange Peel Buckets; Drag Line or Drag Scraper Buckets; Cable Take-Up Reels; Counterweight Drums.

Manufacturers also of Coal Handling, Dredging and Traveling Machinery; Skid



Excavators; and Snow Handling Buckets.

The four separate types of Hayward Buckets cover the whole field of grab bucket usage. For this reason a Hayward recommendation is unbiased. It is based exclusively upon your own individual needs. Catalogs and pamphlets on request.



Class "E" Ore Bowl Clam Shell Bucket

### CLAM SHELL BUCKETS:

**Class "E" Type:** For digging and rehandling bulk material such as sand, gravel and crushed stone. Can be fitted with teeth for digging the harder materials from the natural state. In proportion to size, the ore or flat bottomed bowl bucket, because of its shovel-like blades, carries larger loads and digs harder materials than the regular or curved bowl bucket. Built in sizes from  $\frac{1}{2}$  cubic yard up, in standard and light types. Dwarf sizes from  $1\frac{5}{8}$  cubic feet to 9 cubic feet.

A Class "E" Clam Shell Bucket of special light weight construction is furnished and recommended for handling coal and coke.

**Class "K" Type:** A powerful digging Clam Shell Bucket suited to natural excavating, hard digging and speedy rehandling work. Operated on *three, four, five or six* parts of line according to the material handled, the Class K provides a single bucket for practically all digging and rehandling work. Furnished with or without manganese steel teeth. Built in sizes from  $\frac{1}{4}$  cubic yard up.

**Electric Motor Type:** Used in power and industrial plants for digging and rehandling coal, ashes, ore, coke, slag and similar materials. Requires no closing line. Can be instantly attached to crane, electric hoist or ordinary derrick. Opening and closing of bucket accomplished by motor within the bucket, controlled by lever in operator's cab. Built in sizes from  $7\frac{1}{2}$  cubic feet up, with alternating or direct current motor.

Electric Motor Clam Shell Bucket



Standard Orange Peel Bucket

### ORANGE PEEL BUCKETS:

**Standard Type:** An all-purpose contractor's bucket for sewer work, digging in gravel banks, removing overburden, dredging, excavating and rehandling rocky materials. Strong, ruggedly built, this Standard Type offers a bucket that will meet severe bucket requirements. Also available in extra heavy type. Sizes from 2 cubic feet up.

**Multi-Power Type:** Two part side chains give nearly 60% greater penetrating and closing power than in Standard Orange Peel Buckets. Recommended for digging and rehandling clay, compact sand or any similar material



Multi-Power Orange Peel Bucket

free from large rocks or solid substances. Built in sizes from 2 cubic feet up.

**Three Bladed Type:** Designed to handle blasted rock, boulders and other hard, odd-shaped materials. Also suitable for heavy digging, back filling and excavating in rocky soil formations. Available, as well, in an extra heavy type. Sizes from 21 cubic feet up.

**Dwarf Type:** Hand operated digging bucket for work where space is limited. Similar in construction to larger Hayward Orange Peel Buckets. A hammer weight attachment (as shown in cut) for digging harder and more compact materials can be supplied when needed. Built in sizes from 100 cubic inches to 1 cubic foot. Corresponding overall diameters 10 to 22 inches.

### DRAW LINE OR DRAW SCRAPER BUCKETS:

Hayward Draw Line Buckets are used for digging either loose muck, compact material, stone, boulders, lump coal and similar materials.

Two designs, Open Front Type and Hooded Type, are furnished.

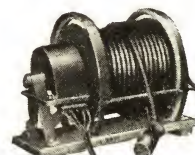
**The Open Front Type** permits free loading and discharging without hindrance from obstructing bales or pulling bridles. It carries a full load to end of boom without spilling. Short pulling bridles enable this bucket to fill within its own length and to dump quickly. The open front design, without projections other than teeth, makes possible placing the cutting edge at any predetermined angle to bank, regardless of bank slope. Low headroom permits operation with short boom.

**The Hooded Type** Drag Line has corresponding advantages. It is recommended for light, medium and heavy work.

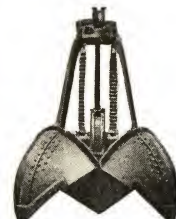
Capacities both for Open Front and Hooded Types from  $\frac{1}{4}$  cubic yard up.

### AUTOMATIC CABLE TAKE-IN REEL:

Automatically pays out and takes up cable used for operation of Hayward Electric Motor Buckets and lifting magnets, responding to every movement of magnet or bucket. Flexible cable up to 1 inch diameter and up to 150 feet long can be handled by Standard Model. Other models for larger or longer cables.



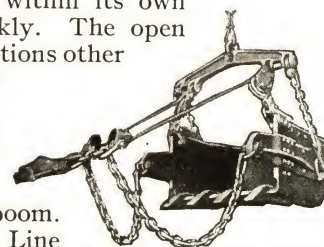
Standard Automatic Cable Take-In Reel



Three Bladed Orange Peel Bucket



Dwarf Orange Peel Bucket



Drag Line or Scraper Bucket



# HOMESTEAD VALVE MANUFACTURING CO.

P. O. Box 76, CORAOPOLIS, PA.

Established 1892

Represented in All Industrial Centers

Incorporated 1898

## PRODUCTS:

Quarter-Turn Valves, Homestead: Straightway, Three-way Four-way Types.

Lift-type Valves.

Round Port Valves: Acid Resisting, Steel or Semi-Steel.

Blow-off Valves, Hovalco-Homestead Combination Boiler.

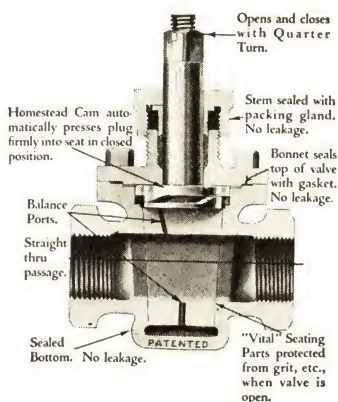
Air Shut-off Valves, Homestead Ross.

Hydraulic Operating Valves, Homestead Protected Seat (B. & O. Patents).

Hypressure Jenny: Generator of a Vapor Blast for economical cleaning, disinfecting and deodorizing.

Valves of special design or of special material will be made in quantity to meet your requirements.

Write for New Valve Reference Book No. 36.



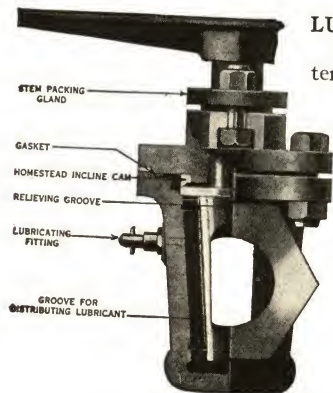
## HOMESTEAD QUARTER-TURN VALVES:

Homestead Quarter-Turn Plug Valves are made in straightway, three-way, and four-way types with either screwed or flanged connections and cast in metals suitable for the fluids and temperature conditions to be handled. All Homestead Quarter-Turn Valves are constructed and operate on the principle illustrated to the left. The three-way and four-way types are designed primarily to direct flow. The plug is seated in the two extreme positions of the valve operating lever.

In ordering Homestead Valves please be sure to give the operating pressure, temperature, and fluid to be handled.

## LUBRICATED VALVES:

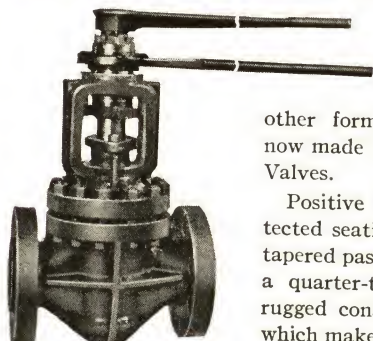
All types of Homestead Quarter-Turn Valves in sizes larger than 1½" may be lubricated by means of the Alemite System—a positive force feed method of lubrication. Lubrication in the Homestead Valve affords the advantage of added protection to the seating surfaces on corrosive services and gives added ease of operation to the larger size valves. Special lubricants to inhibit the corrosive action of specific fluids can be supplied.



## LIFT-TYPE VALVES:

Turn Freely—Close Tightly.

Large plug valves can now be operated easily under high pressures with the new Homestead lifting features. In fact, the hardest valve jobs in your plant—jobs on which all other valves have stuck or have given some other form of operating trouble—are now made easy by Homestead Lift-type Valves.



Lift-Type Valve

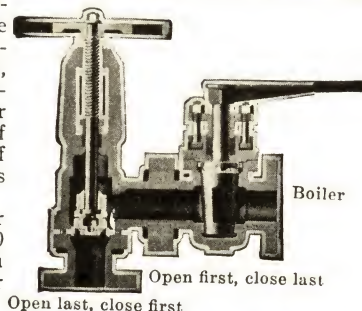
Positive lifting, positive seating, protected seating surfaces, straight, smooth tapered passages through plug and body, a quarter-turn to open or close, and rugged construction are all advantages which make Homestead Lift-type Valves especially suitable for your requirements.

## HOVALCO-HOMESTEAD BOILER BLOW-OFF:

For 250 and 400 pound working pressures. The double blow-off arrangement represents the accepted practice in hundreds of power plants and meets the requirements of the A.S.M.E. Code and those states where two valves are specified on the blow-off line.

In addition to the characteristic advantages of the individual valves, this combination makes it possible, if used in the proper manner, to regrind, renew or reverse the seat and disc of the "Hovalco" blow-off valve while the boiler is under pressure.

Made of semi-steel for pressures not exceeding 250 pounds. Cast steel with monel mounting for higher pressures.



## HOMESTEAD PROTECTED SEAT OPERATING VALVE: (B. & O. Patent) Three-Way Type

Hydraulic operation, without the constant change of seats or cup leathers.

**Advantages:** PROTECTED SLEEVE: The Protecting Sleeve feature prevents wire drawing or cutting of seats and discs by the velocity of the high pressure fluid. Permits accurate control of press or cylinder.

**RENEWABLE DISCS:** No leather cups used. The renewable seating discs are made of fibre and supplied at small cost.

**LOW COST OF UPKEEP:** Fibre discs remain tight many times longer than the discs or cups on other valves because of the protected seat feature.

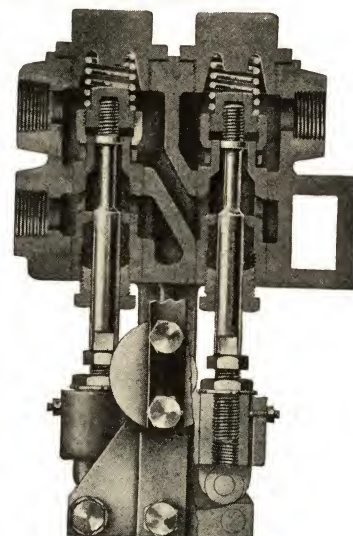
**NO LEAKAGE:** Saving of fluid loss by reduction of leakage. It has been found that often five times as much water leaks through defective operating valves as is used to do real work.

**INTERCHANGEABLE PARTS:** Can be removed through the valve end without removing valve from the line.

**BALANCED AREAS:** To insure ease of operation.

Made in 2-Way, 3-Way and 4-Way patterns with either flanged or screwed connections. For use in all industries where machinery is operated by hydraulic or pneumatic pressure.

Pressures to 3000 pounds—Direct or remote control.



## HYPRESSURE JENNY: (Vapor Spray Cleaner)

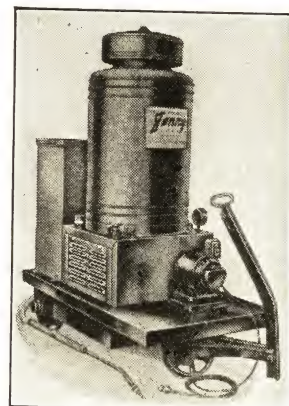
The most advanced machine in the cleaning field for industrial or automotive cleaning.

One man operated . . . 100% automatic . . . fully enclosed . . . Fool proof . . . safe, compact and portable . . .

Hypressure Jenny is instantly adaptable to any work from difficult grease removal or paint stripping, etc., to the delicate job of washing polished metal surfaces.

It cleans 8 to 12 times faster than ordinary methods. Its list of users is a representative cross-section of American industry. Its record of economies effected is outstanding.

Send for descriptive bulletin—or better still, call in one of our trained representatives to discuss your problems.



Model D



## RODNEY HUNT MACHINE CO.

80 RIVER ST., ORANGE, MASS.



### PRODUCTS

#### TURBINE WATER WHEELS

Both Hydro-Electric and Mill Type

#### WATER CONTROLLING APPARATUS

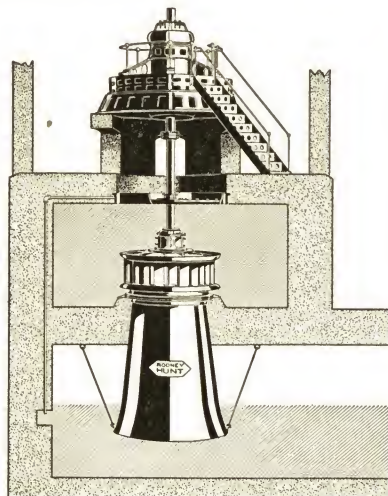
Sluice Gates, Gate Hoists, Stands, etc.

#### TEXTILE WET FINISHING MACHINERY

ROLLS—Wood, Metal, Rubber

### WATER TURBINES

Vertical and Horizontal designs for both hydro-electric or direct mill drives; high and low speeds to suit heads up to 300 ft. Built for open, enclosed and spiral flumes.



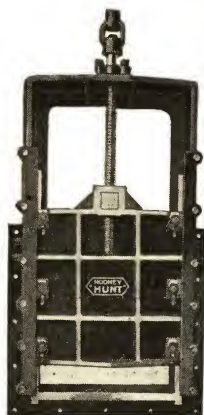
93.38% Efficiency Holyoke Testing Flume New High Record



"Tri-Seal"  
Hand Operated, Floor Stand

### FLOOR STANDS AND GATE HOISTS

Complete range of sizes and designs, non-rising and rising stems. Built for hand control or motor operated, or both if desired, also hydraulic operated.



### SLUICE GATES

For Dams, Penstocks, Reservoirs, Canals, etc. Non-rising and rising stems. Single and double pressure. Plain and wedge types. Made of timber, cast iron, cast steel, welded steel, galvanized iron, bronze or other metals as conditions require.

## INDUSTRIAL BROWNHOIST CORP.

GENERAL OFFICES: BAY CITY, MICH.

### DISTRICT OFFICES

NEW YORK, 50 Church St. CHICAGO, 208 So. La Salle St. Bldg.  
PHILADELPHIA, Broad St. Station Bldg. CLEVELAND, 4403 St. Clair Ave.  
MONTREAL, CANADA, Canadian Brownhoist, Ltd., Box 370, Station O

### PRODUCTS:

STEAM, DIESEL, GASOLINE LOCOMOTIVE CRANES; ERECTION CRANES; CRAWLER CRANES AND SHOVELS; WRECKING CRANES; BRIDGE CRANES.

Also Wharf and Gantry Cranes; Transfer and Pillar Cranes; Overhead Cranes; Railway Pile Drivers; Steam Pile Hammers; Steam and Board Drop Forging Hammers.

Belt and Chain Conveyors; Coal and Ash Bins, Weighing Laries; Clamshell and Link-Type Buckets.

### GENERAL:

Industrial Brownhoist pioneered in the development of cost-cutting, material handling machinery. Today, more than half a century's experience and engineering skill is back of its products—each a standard with which similar products are compared.

### LOCOMOTIVE CRANES:

Industrial Brownhoist builds the world's largest and most complete line of locomotive cranes—a type and size for every handling need. Capacities range from 6 to 200 tons. Gasoline or Diesel power drive can be furnished on sizes up to 40 tons and steam operation on cranes of 10 tons or over. Crawler mountings can be had on sizes up to 25 tons and railroad truck mountings can be furnished on sizes from 10 tons to 200 tons.

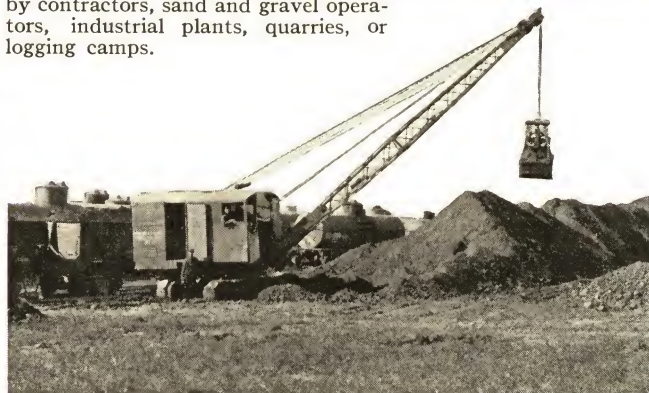


Type L Locomotive Crane on Erection Service

Industrial Brownhoist cranes are quickly adapted to all kinds of work with bucket, hook, magnet or pile driver attachments. Their dependability and satisfactory performance is proved by the thousands of Industrial Brownhoists in use throughout the world—far more than any other make.

### CRAWLER CRANES AND SHOVELS:

Industrial Brownhoist builds a full line of convertible crawler machines and offers to users of that class of equipment the right type and size to meet any demand. Each will effect great savings in time and money on any handling job. Crane capacities range from 6 to 25 tons; shovel capacities,  $\frac{1}{2}$  yard to  $1\frac{1}{8}$  yards. All are carefully built of the best materials and are unsurpassed for use by contractors, sand and gravel operators, industrial plants, quarries, or logging camps.



Industrial Brownhoist Gas Crawler  
Unloading Coal from Cars to Storage



# INGERSOLL-RAND COMPANY

11 BROADWAY, NEW YORK, N. Y.

Branches or Distributors in Principal Cities the World Over

BIRMINGHAM  
BOSTON  
BUFFALO  
BUTTE  
CHICAGO

CLEVELAND  
DALLAS  
DENVER  
DETROIT  
DULUTH

EL PASO  
KNOXVILLE  
LOS ANGELES  
NEWARK

NEW ORLEANS  
NEW YORK  
PHILADELPHIA  
PITCHER

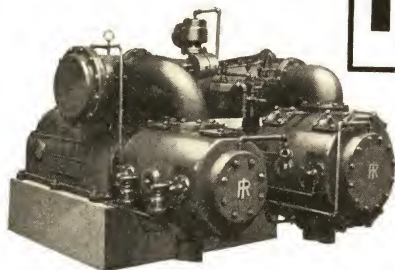
PITTSBURGH  
SALT LAKE CITY  
SAN FRANCISCO  
ST. PAUL

SCRANTON  
SEATTLE  
ST. LOUIS  
TULSA  
WASHINGTON, D. C.

To avoid delays in correspondence address requests to nearest branch

## AIR AND GAS COMPRESSORS

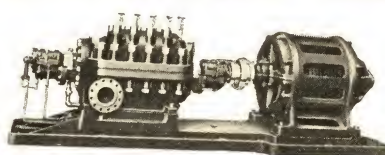
Ingersoll-Rand compressors are built in sizes delivering from 1 to over 15,000 cfm. They can be obtained for any commercial discharge pressure and are available with long-belt short-belt, or V-belt drive; with direct-connected electric motor, oil-engine, gas engine, or steam engine. Suitable regulators are furnished for any kind of service. *Bulletins on request.*



## CAMERON PUMPS

Cameron Pumps are built in centrifugal and direct-acting types and in sizes suitable for every fluid handling problem. The centrifugal line includes single-stage and multi-stage pumps. They may be driven by electric motors, steam turbine, internal combustion engine or by belt.

Cameron direct-acting pumps include both the piston and plunger types and the vertical sinking type. Motor pump units with built-in motor 5 to 1000 g.p.m., heads to 200 ft. *Bulletin 7464.* UV units 20

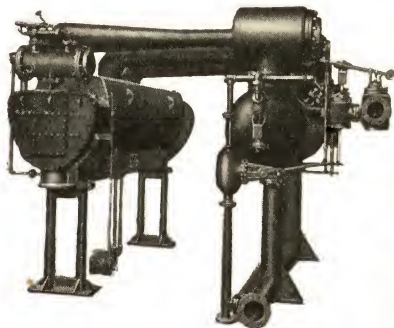


to 1000 g.p.m., heads to 250 ft. *Bulletin 1986.* Other general service units, boiler feed units, condensate units, etc., refer

to nearest branch office for literature. Direct-acting units, *Bulletin 7404.*

## REFRIGERATION EQUIPMENT

I-R Water-Vapor Refrigerating Units are particularly adapted to applications where refrigerating temperatures are moderate, such as air conditioning and numerous processes in industrial plants. Their chief advantages are simplicity, safety, economy, sustained capacity and overload capacity. Water itself is the refrigerant. No chemicals are used.

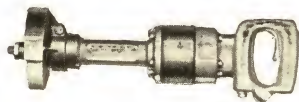


Two types of units permit the selection of the most economical equipment to meet any conditions of steam or electric power, cooling water supply and refrigerating requirements.

The steam-jet type shown here employs steam-jets to compress the vapor and can be furnished with either a surface- or barometric-type condenser. The centrifugal type, an exclusive I-R development, uses a specially developed centrifugal compressor. *Bulletins on request.*

## INGERSOLL-RAND PNEUMATIC TOOLS

The Ingersoll-Rand line of pneumatic tools includes chipping, scaling and caulking hammers; coal picks and core breakers; riveters; holders-on and jam riveters; drills, of all types; wood-boring machines; flue rollers; portable grinders and wire brushes; air motor hoists and stationary air motors; portable pneumatic saws; clay and trench diggers; back-fill tampers and sand rammers; stationary grinders, hoists, etc. *Bulletin 12,100.*

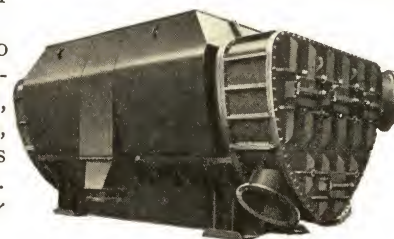


## STEAM CONDENSERS

Ingersoll-Rand Surface condensers have established remarkable records for efficient and reliable performance in central stations throughout the country. Such features as a heart-shaped shell with graduated tube spacing, positively controlled longitudinal steam distribution and external air coolers have made possible unusual performance records.

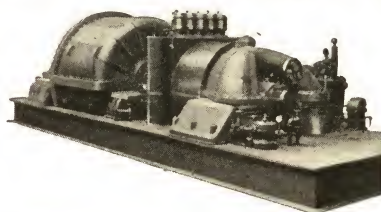
These condensers have been built in sizes from 200 to 160,000 kw. Many sizes are available with shells of either cast iron or welded steel plate.

The Company also manufactures barometric condensers, ejector-jet condensers, and steam jet ejectors or vacuum pumps. *Surface Condenser Bulletin 9227.*



## TURBO BLOWERS AND COMPRESSORS

I-R turbo blowers are available for lower and medium discharge pressures from  $\frac{3}{4}$  lb. gauge to 40 lb. gauge for 100 to 110,000 cfm. These blowers are used for: iron blast furnaces, Bessemer converters, copper blast furnaces, copper converters, copper flotation, lead furnaces, foundry cupolas, exhausting coke oven gas, exhausting illuminating gas, boosting illuminating gas, operating water gas sets, atomizing fuel oil for oil burners, activated sludge sewage-disposal plants, agitation, etc.



I-R turbo compressors are available in capacities from 5,000 to 10,000 cfm. of free air. They attain discharge pressures of 90 to 110 pounds per square inch. *Bulletin 3132.*



# THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET, NEW YORK, N. Y.

Producers of Monel Metal and Nickel

ROLLING MILL: Huntington, W. Va.

MINES AND SMELTER: Copper Cliff, Ont., Canada

REFINERY: Port Colborne, Ont., Canada

## PRODUCTS

**\*Monel Metal:** A silvery-white alloy containing approximately 67% nickel and 28% copper.

**Pure Nickel:** Commercially pure, malleable nickel.

**Nickel-Clad Steel Plate:** A hot-rolled bi-metal plate having a layer of nickel firmly bonded to a heavier layer of steel. Rolled by Lukens Steel Company.

**N. C. C. Pig (Nickel-copper Chromium):** For the production of Ni-Resist, corrosion resisting cast iron.

**Refined Nickel:** Block, shot, and electrolytic (99.95%) nickel: for the production of ferrous and non-ferrous nickel alloys. Also nickel oxide and reduced nickel oxide.

*\* Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.*

**Forms:** MONEL METAL and NICKEL:

Rod, Hot Rolled	Plate	Castings	Bolts & Nuts
Rod, Cold Drawn	Tubing	Forgings	Rivets
Sheet, Full Finished	Shot	Strip	Washers
Sheet, Cold Rolled	Ingot (pig)	Angles	Welding Rod

## QUALITIES OF MONEL METAL

Monel Metal is highly resistant to corrosion by practically all alkalis, most acids and salts, as well as organic substances. Thus it is probably resistant to a wider range of corrosive conditions than any other one alloy commercially available for chemical and processing equipment. With corrosion resistance it combines great strength, toughness and ability to withstand abrasion and fatigue. Monel Metal is available in all commercial forms and, since it possesses excellent working qualities, it can be fabricated by all the usual methods of working metals.

### MONEL METAL—MECHANICAL PROPERTIES

Mechanical Property Ranges of Standard Products

	Tensile Strength, Lbs. Per Sq. In.	Yield Point, Lbs. Per Sq. In.	Proportional Elastic Limit, Lbs. Per Sq. In.	Elong. % in 2 In.	Red. in Area, %
Rod and bar					
Cold drawn					
Annealed	70,000-85,000	25,000-35,000	20,000-30,000	35-50	65-75
As drawn	85,000-125,000	60,000-95,000	.....	15-35	50-65
Hot rolled	80,000-95,000	40,000-65,000	25,000-40,000	30-45	50-65
Forged	80,000-110,000	60,000-85,000	45,000-65,000	20-40	...
Wire, cold drawn					
Annealed	70,000-85,000	.....	.....	...	...
No. 1 temper	95,000-110,000	.....	.....	...	...
Regular	110,000-140,000	.....	.....	...	...
Spring	140,000-175,000	.....	.....	...	...
Plate, hot rolled	60,000-75,000	25,000-35,000	.....	25-35	...
Sheet and strip					
Full-finished sheet	65,000-80,000	25,000-35,000	20,000-30,000	...	...
Cold rolled					
Annealed	65,000-80,000	25,000-35,000	20,000-30,000	...	...
Full-hard sheet	100,000-120,000	90,000-110,000	.....	...	...
Full-hard strip	100,000-125,000	90,000-115,000	.....	...	...
Tubing, cold drawn					
Annealed	65,000-80,000	25,000-35,000	20,000-30,000	...	...
As drawn	90,000-105,000	60,000-75,000	.....	15-25	...
Casting	65,000-100,000	30,000-60,000	.....	5-35	5-35

## GRADE "S" MONEL METAL CASTINGS

Where a Monel Metal casting is desired capable of being heat-treated to high hardness, Monel Metal Grade "S" is offered.

**Mechanical Properties (as cast):** (Grade S).

Tensile Strength (in pounds per sq. inch)... 100,000 to 120,000

Yield Point (in pounds per sq. inch)... 90,000 to 110,000

Elongation (% in 2")... 2 to 5

Reduction of Area (Percentage)... 2 to 5

Brinell Hardness... 275 to 350

These castings may be softened and rehardened by heat treatment. In the soft condition they show a hardness of between 180



and 200 Brinell. After rehardening they show a hardness up to or in excess of 350 Brinell (actually recorded 372 Brinell).

**Qualities:** In addition to the properties and qualities of regular Monel Metal, Monel Metal Grade "S" possesses higher maximum hardness with greater resistance to wear or abrasion, erosion and greatly improved non-galling properties when operated against itself and numerous other metals up to steam temperatures. It can be machined and hardened by heat treatment.

## USES OF MONEL METAL

Monel Metal is used for numerous applications where strength at high temperatures, hardness, toughness, and resistance to corrosion, erosion, and abrasion are essential requirements.

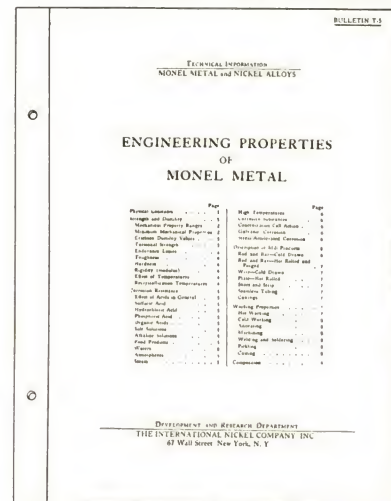
In power plant equipment, Monel Metal is generally used for the internal vital parts which actually control and direct the steam, water, gases, compressed air, etc. The following list indicates the types of parts in various classes of equipment for which Monel Metal is recommended.

- Valves, Regulators, etc.: Stems, seats, discs, gaskets, bushings, studs, springs, diaphragms.
- Turbines: Blades, shrouding, strainers, valve trim, garter springs.
- Pumps (Reciprocating): Plungers, rods, liners, valves, springs, studs.
- Pumps (Centrifugal): Shafts, impellers, shaft sleeves, wearing rings.
- Condensers: Tubes, tube sheets, valve trim.
- Meters: Gears, racks, shafts, floats, orifices, bulbs, sockets.
- Traps: Floats, valve trim, toggle pins, bolts, springs, nuts, diaphragms.
- Miscellaneous: Gaskets, screws, springs, bolts, nuts, castings, machined parts.

## FABRICATED EQUIPMENT

While we do not manufacture finished power equipment, we shall be glad to put you in touch with reliable manufacturers who can supply you with any type of equipment you may require.

## LATEST ENGINEERING FACTS ABOUT MONEL METAL



Recent improvements in the technique of rolling, forging and drawbench operations on Monel Metal have resulted in higher and more uniform physical properties. These properties are listed in detail in the bulletin, "Engineering Properties of Monel Metal" which has just come off the press.

It contains certified values for maximum and minimum properties of commercial forms of Monel Metal. You will find the reliability and accuracy of this information extremely helpful in designing or buying Monel Metal equipment of the correct corrosion-

resisting and physical characteristics. Write for your copy today.

## TECHNICAL RESEARCH AND SERVICE

On specific problems feel free to request the advice and cooperation of our technical staff. By their long and extensive experience they are well qualified to assist you in selecting a metal or alloy which will meet your requirements.



# D. O. JAMES MANUFACTURING COMPANY

1114 WEST MONROE ST., CHICAGO, ILL.

*Speed Reducing Transmissions, Cut Gears, Racks and Flexible Couplings*

## BRANCH OFFICES

NEW YORK, N. Y.  
BUFFALO, N. Y.  
CLEVELAND, OHIO

DETROIT, MICH.  
PITTSBURGH, PA.  
MILWAUKEE, WIS.

MINNEAPOLIS, MINN.  
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SEATTLE, WASH.

PORTLAND, ORE.  
LOS ANGELES, CAL.  
PHILADELPHIA, PA.

CINCINNATI, OHIO  
ST. LOUIS, MO.  
BIRMINGHAM, ALA.

## PRODUCTS:

**Speed Reducers** of the Planetary Spur Gear type, Medium and Heavy Duty Work Gear type, Generated Continuous Tooth Herringbone type and Spiral Bevel Gear type; also Motorized Speed Reducers. Each made to drive up, down, horizontally or at any angle.

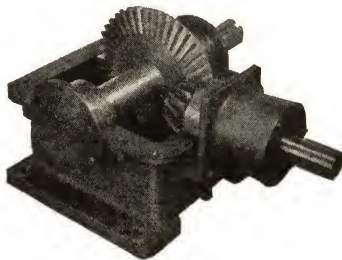
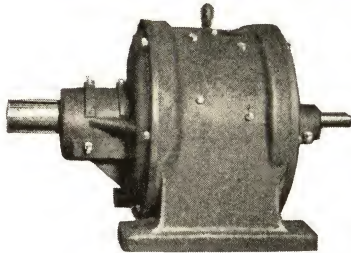
**D.O.JAMES**  
TRADE-MARK

**Gears** of the Cut Spur, Straight and Spiral Tooth Bevel Mitre, Spiral, Worm, Internal, Helical, Herringbone and Tractor types, any size—any material.

Also Sprocket Wheels, Racks, Flexible and Universal Couplings and combined Automatic Back-Stop and Flexible Coupling.

## PLANETARY SPUR GEAR SPEED REDUCERS:

**Straight Line Type:** James Planetary Spur Gear Straight Line Speed Reducers are available in all sizes,  $\frac{1}{4}$  to 50 H. P. Ratios from 4:1 to 1600:1, and larger. Many standardized sizes are carried in stock for immediate shipment.

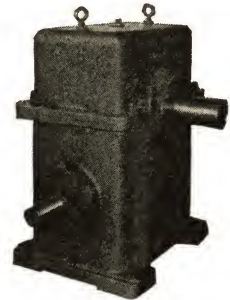


## SPIRAL BEVEL GEAR SPEED REDUCERS:

Horizontal and Vertical Spiral Bevel Gear Speed Reducers, available in sizes from  $\frac{1}{2}$  to 200 H. P. Ratios 1:1 to 6:1.

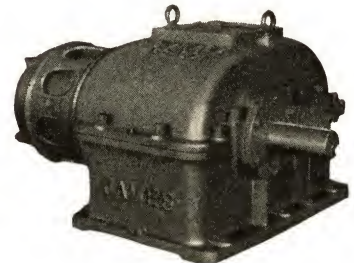
## HEAVY DUTY WORM GEAR SPEED REDUCERS:

James Heavy Duty Worm Gear Speed Reducers, are made with Worm top or bottom, to drive up or down, or at right angles. Latest and most advanced types, sizes 1 to 100 H. P. Ratios from 6:1 to 60:1.



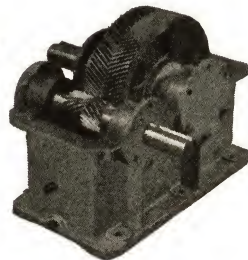
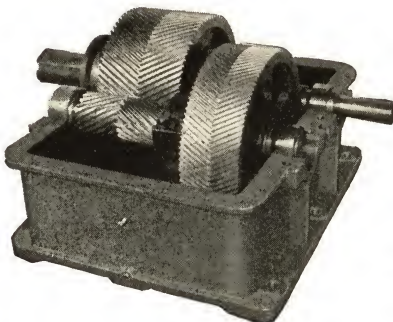
## MOTORIZED SPEED REDUCERS:

Herringbone type available in a large range of sizes.



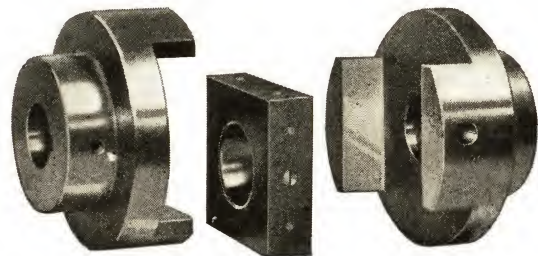
## HERRINGBONE GEAR SPEED REDUCERS:

James Generated Continuous Tooth Herringbone Gear Speed Reducers are made in single and double



## FLEXIBLE COUPLINGS:

D. O. James Flexible Coupling, mechanically flexible, simple construction—only three parts.



reduction types for heavy duty and severe service.

Sizes 1 to 1000 H. P. or larger. Ratios  $1\frac{1}{2}$ :1 to 100:1.

## COMPLETE CATALOG:

Send for literature giving complete engineering data.



# JARECKI MANUFACTURING CO.

1852-1935  
83rd Anniversary

ERIE, PA.

*Manufacturers of Cast Iron, Malleable and Brass Pipe Fittings; Bronze and Iron Valves and Cocks, Etc., for Steam, Gas, Water, Air and Oil—Governors—Pipe Threading Tools—Oil Well Supplies*

## JARECKI MALLEABLE, CAST IRON AND BRASS PIPE FITTINGS:



Malleable Fitting

Are made in all styles and sizes. Standard, Extra Heavy and Hydraulic, Screwed and Flanged. All screwed fittings are recessed to permit the easy entrance of pipe.

## OUR "JARCO" MALLEABLE UNIONS, UNION ELBOWS AND TEES:

(Approved by the Underwriters' Laboratories, Inc.)



"Jarco" Union

Have a brass-to-iron ground joint seat requiring no gasket. The inserted brass ring is forced into place by a special process and cannot be loosened. Recommended for 250 lbs. steam working pressure. We also manufacture Malleable Lip Unions and Brass Ground Joint Unions for Standard, Extra Heavy and Hydraulic Pressures.

## BRONZE AND IRON VALVES AND COCKS:

A comprehensive line is kept in stock at all times. Manufactured in Globe, Angle, Cross, Check, Gate and Regrinding patterns for Standard, Medium, Extra Heavy and Hydraulic Pressures.



Regrinding Globe Valve

## JARECKI BRONZE REGRINDING VALVES:

Are made for 125 lbs., 200 lbs. and 300 lbs. steam working pressures; may be repacked under pressure when valve is wide open.

## "JARCO" BRONZE GATE VALVES:

( $\frac{1}{4}$ " to 3") are made in two patterns for 125 lbs. and 150 lbs. steam working pressures. They have wedge gates with non-rising stems and open to left.

May be repacked under pressure when valve is wide open.



"Jarco" Bronze Gate Valve

## JARECKI IRON BODY VALVES:

Are made in Globe, Angle, Cross, Elbow, Gate (Double Disc or Wedge Gate) and Check patterns with Plain or Yoke Top, Brass Mounted with Brass or Steel Stem, Screwed or Flanged, for Standard, Extra Heavy or Hydraulic Pressures.



Iron Body Wedge Type Gate Valve



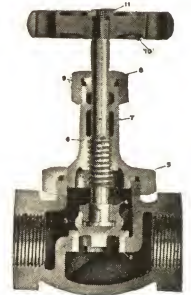
Iron Body Globe Valve



Iron Body Engine Valve, for 250 Lbs. Steam Working Pressure

## JARECKI NICKEL SEAT AND DISC VALVE:

This valve has an Iron Body, Brass Mounted. The Seat and Disc are made of a nickel alloy of great hardness, or bronze if so ordered. So constructed that seat is self-cleaning. Seat and Disc may be reground or renewed making valve practically indestructible. For 150 lbs. steam working pressure. Can be repacked under pressure when valve is wide open.



Renewable Nickel Seat and Disc Valve

## THE "ERIE" UNLOADER:

For all Air Compressors.

Maintains practically a constant air pressure in the receiver by governing the inlet of the Compressor to let in only the amount of air required.

Completely unloads and loads Compressor without shock or strain.



## THE "ERIE" GOVERNOR:

For all steam driven Pumps, Air Compressors and Vacuum Pumps.

For close regulation and wide range of speed up to 4 to 1 ratio.

The Compressor Governor governs the speed of the Compressor to maintain the slowest constant speed which will furnish the required supply and also maintain a constant air pressure.



Erie Compressor Governor

## "JARECKI" PIPE VISES:

Are built to stand up under the most severe use. Only malleable iron and hardened and tempered steel used in their construction. Six sizes handling from  $\frac{1}{4}$ " to 16" O. D. Other styles of vises made for lighter work.

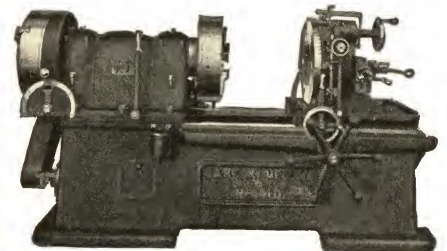


"Jarcki" Pattern

## JARECKI PIPE THREADING MACHINES:

Built in Standard and Heavy Duty High Speed Types,  $\frac{1}{4}$ " to 12".

One set of H.S.S. chasers threads standard range without change. Automatic self-opening Die Head with Thread Length Dial. Timken Bearing Equipped. H.S. Steel Dies. Extreme speed in threading and cutting off. Low operating and maintenance costs.



No. 6 (1" to 6") Heavy Duty High Speed



# THE JOHNSTON & JENNINGS CO.

879 ADDISON ROAD, CLEVELAND, OHIO

## PRODUCTS

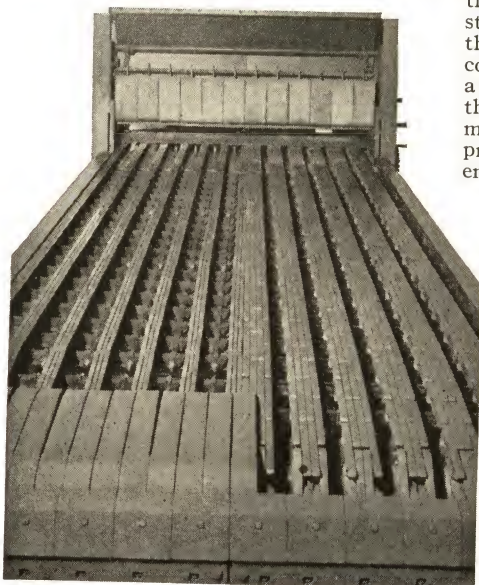
Stowe stokers for 50 to 5000 horse power, U. S. molding machines, Machinery forgings, Heavy iron and semi-steel castings up to 30 tons, Job machine work, Special machinery designed and built to order,

Oceco pumps, Positive displacement liquid meters, 10-gallon industrial fire extinguishers, Gas-tight, fire-safe tank fittings for hazardous and volatile liquid storage tanks.

### THE STOWE STOKER

In the Stowe Stoker, stationary grate surfaces oppose the forwarding efforts of moving chains to accomplish ideal fuel bed progression—fast at the feeding end but slower and slower toward the discharge end to compensate for fuel burned away and maintain a compact fire to the very end of the grate.

At the rear end of the stoker, there is an ash retarding stationary housing. The entire fuel bed must be in compression before ash can be pushed across this final ash retarding surface. Stationary grate surfaces alternating between continuously progressing chains make this compressing influence exactly the same throughout the entire length of stoker. This keeps the coal everywhere collected together in a fuel bed of constant thickness, and permits full wind-box pressure to the very end of the fire.



View of Partially Dismantled Stowe Stoker Showing How Moving Chains (at Right Only) Alternate with Stationary Grates (at Left Only). About a Quarter of the Grate Surface Does Not Move. This Retarding Effect Produces a Uniformly Thick and Closely Compressed Fuel Bed to the Very End of the Grate

The Stowe is the only stoker that continually subjects the active fuel bed to this compressing influence and compels the fuel bed to use air economically under all conditions. This action in the Stowe is automatic at all loads and for all fuels and eliminates the need of continual adjustments.

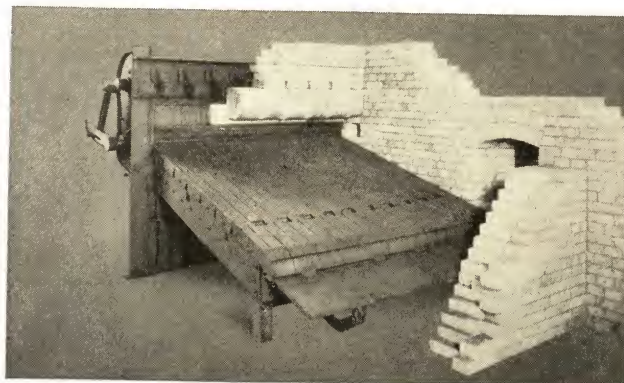
Because thickness and blast resistance are uniform throughout the entire fuel bed, an unusually wide variety of coals can be burned both smokelessly and efficiently.

### STOWE TYPE R STOKER

For installation with boilers of from 50 to 300 b.hp. The Stowe Type R Stoker is approved by the Anthracite Institute when used in connection with the combustion of Buckwheat No. 1 and No. 2 (Rice) Anthracite, and mixtures of Buckwheat No. 1 and No. 2 (Rice) and No. 3 (Barley) sizes. Stowe Type R Stokers are thoroughly flexible and automatically adaptable to a wide range of fuels, including all grades of bituminous.

The inclined grate area is comprised of alternate moving and stationary grates. About 40% of the grate area does not move. The moving grate bars operate longitudinally forward and backward to create and maintain a closely compressed and evenly burning fire over the entire grate area.

At the rear end of the grate is a stationary housing which delays the discharge of ash and reduces its combustible content. This retarded discharge combines with other retarding influences to oppose the positive forward progression of the fuel through the furnace and compensates for fuel burned away by thickening the fuel bed toward the rear of the grate where its combustible is lowest.



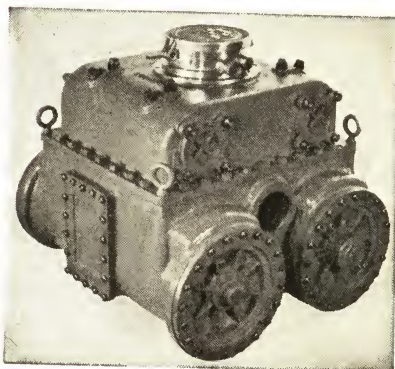
Stowe Type R Stoker with Brick Partly Removed

In this way is set up a fuel bed of uniform draft resistance. Islands of coke, fissures, and bare spots cannot exist.

Freedom from operating manipulations is attained by the automatic and continuous action of the Stowe Type R Stoker. Consequently, high average efficiencies are maintained even where skilled operators are not always available.

### OCECO LIQUID METERS

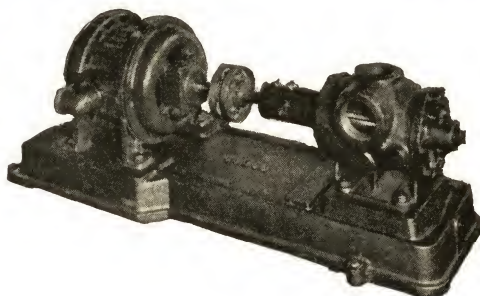
Positive displacement, extremely accurate, calibrated before



shipment and sealed, these meters will give the same accuracy at maximum or minimum pressure whether handling heavy or light liquids, designed so the original accuracy cannot be affected by normal wear, ruggedly constructed for hard service, every part easily accessible, the meter can be completely dismantled without disconnecting from the line.

### OCECO PUMPS

Positive displacement rotary type with a turbine like action, giving smooth, uniform flow; very simple, therefore compact; occupies small space and can be completely dismantled with a wrench without disconnecting from the line; unique construction reduces internal friction to absolute minimum, hence requires less horse power to drive — e x c e p t i o n a l l y quiet due to patented features and unusual design.





# THE JEFFREY MANUFACTURING CO.

904-99 NORTH FOURTH STREET, COLUMBUS, OHIO

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Jeffrey Mfg. Co., Ltd. of CANADA, Head Office and Works, MONTREAL, Branch Offices: TORONTO, CALGARY, VANCOUVER

*Manufacturers of Elevating, Conveying, Crushing, Pulverizing, Mining, Ventilating and Transmission Equipment*

## PRODUCTS:

ELEVATING, CONVEYING, COAL and ASH HANDLING MACHINERY and EQUIPMENT; Screw, Portable, Power, Belt, Trolley, Chain, Slat, Scraper, Apron, Pivoted, V-Bucket, Cable and Monorail Conveyors for ovens, annealing, baking, etc.; Electric Vibrating Feeders, Conveyors, Screens, Dryers and Coolers; Overhead Carrying Systems for factories, warehouses, etc.; Portable Loaders and Unloaders for wagons, trucks, cars, etc.; Bucket Elevators, inclined and vertical, for contractors, etc.; Car Pullers, Elevated Steel Tanks; Apron Type Escalators; Feeders; Gravity, Straight and Spiral Chutes; Power Drag Scrapers; Railroad Coaling Stations; Ash Hoppers and Gates; Chain; Troughing and Flat Belt Idlers; Skip Hoists; Buckets.

COAL and ROCK CRUSHING, PULVERIZING and HANDLING MACHINERY and EQUIPMENT, Electric Rock Drills; Roll, Double Roll and 3-Jaw Crushers; Swing Hammer Shredders; Swing Hammer Pulverizers; Feeders; Tipples; Bins and Bunkers; Screens.

PLANT MACHINERY and EQUIPMENT, including Electric Locomotives, storage battery and trolley; Skip Hoist Cars; Weighing Larries; Speed Reducers; Screens; Chain; Picking Tables; Cast Iron Pulleys and Sprockets; Cast and Cut Gears; Shaft Hangers; Pillow Blocks; Malleable Iron Castings; Soot and Forced Draft Jet Blowers, pressure and volume; Ventilating and Exhaust Fans; Friction and Jaw Clutches; Shaft and Safety Set Collars; equipment for foundries, fertilizer plants, ice handling, mining, paper mills, quarrying, sawmills, sugar refineries, etc.; Gravel Washing and Screening equipment; Sand Settling Tanks; Screens, etc.

## JEFFREY TROLLEY CONVEYORS:

Have a broad application and are the most flexible of all conveyors. There is a proper type for all purposes—transporting, drying, annealing, emersing, baking, storing, inspecting and assembling of all types of materials—regardless of shape, size or

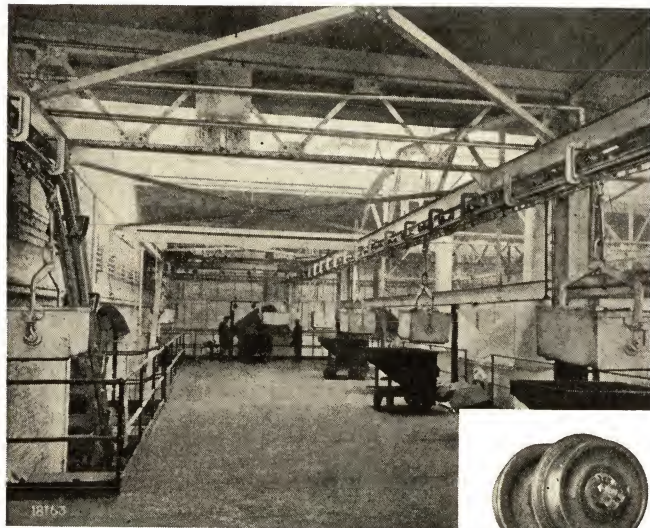


Illustration Above Shows Charging Platform in a Large Brass Foundry. Jeffrey Trolley Conveyors Handle the Charging Buckets from Storage Bins, Upward to Charging Platform, Where They Loop Around Above the Electric Furnaces, Then Back to the Bins

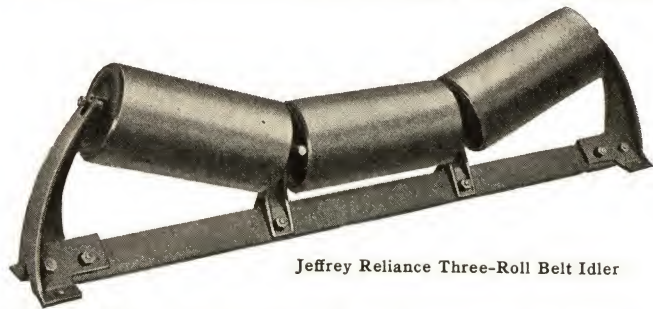
weight. Operations can be speeded up with Jeffrey Trolley Conveyors—they make both vertical and horizontal curves. *Complete data will be sent on request.*



## JEFFREY BELT CONVEYORS:

Provide a steady flow of such material as coal, coke, ore, sand, gravel, crushed stone, etc., through your plant. Troughing, Picking Belt and Flat Belt Idlers—furnished with 4", 5" or 6" diam. rolls, for belt widths up to 60".

Rolls are made of high quality steel tubing with steel ends carefully centered and electric welded, forming a one-piece balanced



Jeffrey Reliance Three-Roll Belt Idler

roll. The instantly removable rolls are interchangeable and have Alemite fittings. Oversize Timken Tapered Roller Bearings are placed directly under load. Self-cleaning base and malleable iron end stands. *Send for Bulletin No. 569-F.*

## JEFFREY SPIRAL CONVEYORS:



Six principal types: Section and Flight, Helicoid, Mixer, Cut Flight, Ribbon and Cast Iron. Have broad application in conveying coal, cement, soda ash, grain, lime, powdered clay, molasses, asphalt, etc. *Catalog No. 495-J.*

## JEFFREY 52-B BELT CONVEYORS:



Designed for conveying coal in the mine but is also practical for many industrial purposes. Made for flat or troughed belt up to 36" and in sections.

## JEFFREY AEROVANE FAN:

For mine and industrial use. The Jeffrey Aerothane Fan is the only disc or propeller fan that will maintain an efficiency of 70% and above when working between 45% and 75% of its maximum volume. Replaces centrifugal type fan where large volumes with high pressures are not required. *Bulletin No. 537-F.*



## JEFFREY INDUSTRIAL LOCOMOTIVES:



Trolley and Storage Battery types for handling all kinds of material. Also combination trolley and storage battery. *Complete information on request.*

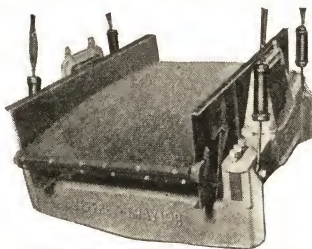


# THE JEFFREY MANUFACTURING COMPANY

## JEFFREY-TRAYLOR ELECTRIC VIBRATING UNITS:

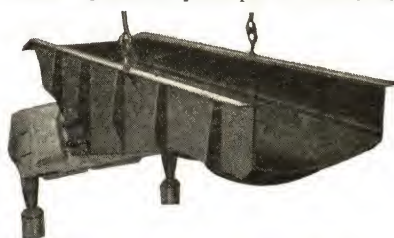
Dependable units for conveying, feeding, screening, drying and cooling of a wide variety of materials. They are entirely electrical with no mechanical parts to replace or lubricate. They consume little power and operate at an unusually low maintenance cost. *Bulletins on request.*

**Screens:** Heavy duty electric vibrating screens for sizing both coarse and fine materials in both wet and dry conditions. Supplied in single or multi-decked styles—sizes range from two to forty square feet. Installation simple and permanent—no heavy supporting structure necessary.



Jeffrey-Traylor Type FB-2 Single Deck Vibrating Screen

**Feeders and Conveyors:** Jeffrey-Traylor Vibrating Feeders and Conveyors are serving many industries in the economical and efficient handling of a wide variety of materials. They embody the Traylor patented principle of controlled vibration and are entirely electrical. Can be furnished in sizes for handling from one ounce per hour up to 1000 tons per hour.

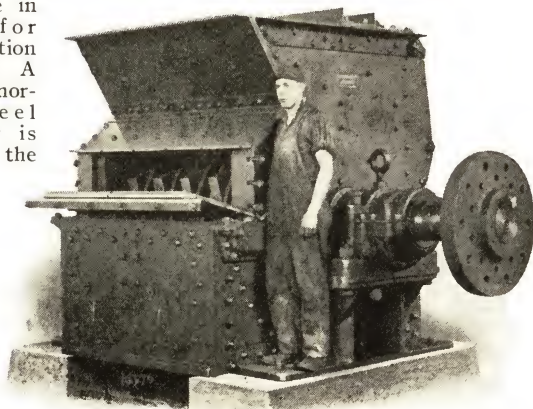


Jeffrey-Traylor Vibrating Feeder for Handling up to 1000 Tons and Over per Hour

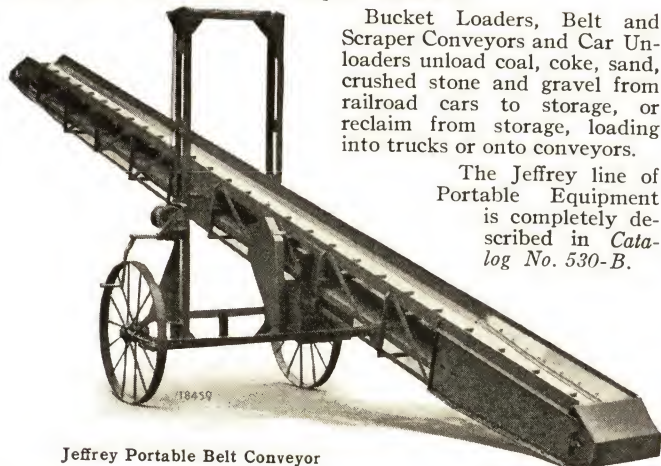
Jeffrey-Traylor Engineers will be glad to explain how these Vibrating Units can be profitably and efficiently adapted to your handling problems.

## JEFFREY PULVERIZERS AND CRUSHERS:

Are made in all sizes for every reduction requirement. A 54" x 48" Armored Steel Pulverizer is shown at the right.



## JEFFREY PORTABLE EQUIPMENT:



Jeffrey Portable Belt Conveyor

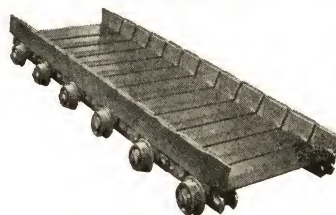
Bucket Loaders, Belt and Scraper Conveyors and Car Unloaders unload coal, coke, sand, crushed stone and gravel from railroad cars to storage, or reclaim from storage, loading into trucks or onto conveyors.

The Jeffrey line of Portable Equipment is completely described in *Catalog No. 530-B*.

## JEFFREY FOUNDRY EQUIPMENT:



The Jeffrey line of mechanical handling equipment for both large and small foundries is complete. It includes: Conveyors of all kinds, Flask Fillers, Reduction Machinery, Sand Reclaiming and Conditioning, Bucket Elevators, Screens, Mixers, Chains, etc. *Catalog No. 540-A.*



Leak-Proof Apron Conveyor



Sand Mixer



Sand Aerator

## JEFFREY BUCKET ELEVATORS:

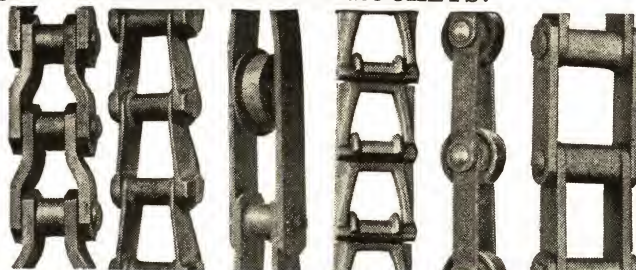
Handle large capacities of stone, ore, cement clinker, slag, coal, ashes, etc. Furnished with or without casings—continuous or intermittently spaced buckets. The Super-capacity Bucket Elevator shown left below was designed for handling large tonnages of limestone.



## JEFFREY "SUPERMAL":

A superior metal for chains and buckets. Has a greatly increased resistance to wear. File hard surface of buckets does not produce a brittle material even in thin sections. Chains and buckets made of "Supermal" will withstand severe shock and fatigue loads without breaking. *Bulletin No. 501-G.*

## JEFFREY CHAINS AND SPROCKETS:



For every elevating, conveying and power transmission purpose. Shown here are: Steel Thimble Roller, Reliance, Steel Bushed Knuckle, Detachable, Malleable Roller and Hercules. *Catalog No. 480-P.*



# JENKINS BROS.

80 WHITE ST., NEW YORK, N. Y.

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*Manufacturers of Valves and Mechanical Rubber Goods*

FACTORIES: BRIDGEPORT, CONN.

JENKINS BROS., LIMITED

CANADIAN WORKS AND HEAD OFFICE: 617 St. Remi Street, MONTREAL, QUE.

LONDON OFFICE: 6 Great Queen Street, KINGSWAY, W. C. 2

## PRODUCTS

VALVES: Globe, Angle, Cross, Check, Hose, Blow-off and Safety Valves; Rapid Action Valves, Quick-opening Valves; Needle Valves; Radiator Valves in a variety of types; Air Valves; Medium Pressure Globe and Angle Valves, in Bronze and Iron; Extra Heavy Valves for high pressures, in Globe, Angle, Cross, Check, Blow-off, Automatic Equalizing Stop and Check, and other patterns; Gate Valves in standard, medium and extra heavy patterns, Solid Wedge, or Double Disc; Valves in Bronze and Iron for all pressures and purposes; Bronze Fire Line Angle Valves; Cast Steel Gate Valves, Series 15 and 30; Underwriters' Hose Gate Valves; Bronze and Iron Body Regrinding Valves. Also Air Guns and Gauge Cocks. Jenkins Discs, Sheet Packing, Gasket Tubing, Ready Cut Gaskets, and other Mechanical Rubber Goods.



Guaranteed for 200 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure.

## JENKINS BRONZE FIRE LINE ANGLE VALVES

Fig. 715-A—719-A for 150 lbs. water working pressure.

Fig. 715-B—719-B for 250 lbs. water working pressure.

Size: 2½ in.

Fig. 715-A and 719-A are for Class A service, for buildings not exceeding 300 ft. in height or for the uppermost 300 ft. in any building; Fig. 715-B and 719-B are for Class B service, for buildings exceeding 300 ft. in height except in the uppermost 300 ft. as previously described. These valves have been approved by the Board of Standards and Appeals of the City of New York.



Fig. 719-B  
Fig. 719-A  
Screw Outlet  
Fig. 715-A  
Fig. 715-B  
Hose Outlet

## JENKINS STANDARD BRONZE GLOBE, ANGLE AND CROSS VALVES

With one-piece screw-over bonnet and slip-on stay-on disc holder.

For 150 lbs. steam working pressure or 250 lbs. oil, water, or gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ½ in. to 3 in.

Trimings of globe, angle and cross valves, screwed or flanged, are interchangeable part for part, size for size. (See Fig. 106-A.)

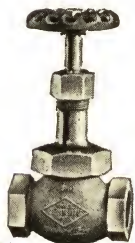


Fig. 106-A  
Globe, Screwed  
Fig. 108-A  
Angle, Screwed  
Fig. 110-A  
Cross, Screwed

## JENKINS STANDARD BRONZE CHECK VALVES

For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ½ in. to 3 in.

The parts of Fig. 117-A and Fig. 118-A are interchangeable, part for part, size for size.



Fig. 117-A  
Horizontal  
Check, Screwed  
Fig. 118-A  
Angle, Check,  
Screwed  
Fig. 119  
Vertical, Screwed  
Fig. 352  
Swing Check,  
Screwed

## JENKINS BRONZE GLOBE, ANGLE AND CHECK VALVES

For 250 lbs. steam working pressure. Sizes: Screwed, ¼ in. to 2 in.; Flanged, ½ in. to 2 in.

These valves are fitted with a Jenkins disc specially compounded to withstand steam working pressures up to 250 lbs. The Disc, being more resilient than metal, readily conforms to the metal seat and insures a tight valve without regrinding.



## JENKINS EXTRA HEAVY BRONZE GLOBE, ANGLE, CROSS AND CHECK VALVES

For 300 lbs. steam working pressure or 500 lbs. oil, water, gas working pressure. Sizes: Screwed, ¼ in. to 3 in.; Flanged, ½ in. to 3 in.

## JENKINS BRONZE REGRINDING GLOBE, ANGLE, CROSS AND CHECK VALVES

For 200 lbs. steam working pressure. Sizes: Screwed, ½ in. to 3 in.; Flanged, ¾ in. to 3 in. Also Regrind—Renew Patterns either with Renewable Nickel Alloy Seat Ring and Disc or Seat Ring and Plug, made in sizes ¼ in. to 3 in.

## JENKINS BRONZE RAPID ACTION VALVES AND QUICK OPENING VALVES

For 150 lbs. water working pressure. Made in sizes up to 3 in.

These valves are for use on laundry washing machines, gasoline bulk terminals and other places where quick on and off operation is essential. These valves are spring closing. A short pull on the end of the lever bears on the end of the spindle, forcing the disc holder off the seat. Fig. 712 and Fig. 720 have plunger and air chamber arrangement that prevents water-hammer and strain apparent when a flow of liquid is suddenly shut off.



Fig. 712 Quick-Opening  
Self-Closing Valve

## JENKINS BRONZE Y OR BLOW-OFF VALVES

Standard Pattern: For 150 lbs. steam working pressure.

Sizes: Screwed, ⅜ in. to 3 in.; Flanged, ½ in. to 3 in.

Extra Heavy Pattern: For 250 lbs. steam working pressure.

Sizes: Screwed, ½ in. to 3 in.; Flanged, ½ in. to 3 in.

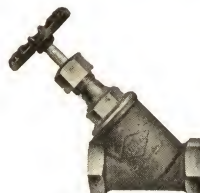


Fig. 124  
Standard Pattern,  
Screwed  
Fig. 134  
Extra Heavy Pattern,  
Screwed

## JENKINS BRONZE GATE VALVES

Standard Pattern: For 125 lbs. steam working pressure or 200 lbs. oil,

water, gas working pressure. Sizes, inside screw: Screwed, ¼ in. to 3 in.; Flanged, ¾ in. to 3 in. Sizes, O. S. & Y.: Screwed, ¾ in. to 3 in.; Flanged, ¾ in. to 3 in.

Jenkins Bronze Gate Valves have globe shaped body and double-faced solid wedge. Guides cast in body prevent chattering when valve is partly open



Fig. 368  
Outside  
Screw and  
Yoke,  
Screwed



and keep wedge in line for perfect seating. When open, the wedge is entirely removed from the pathway of the flow.

**Jenkins Medium Pattern Gate Valves:** For 175 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure. Sizes, inside screw: Screwed,  $\frac{1}{4}$  in. to 3 in.; Flanged,  $\frac{3}{4}$  in. to 3 in. Sizes, O. S. & Y.: Screwed,  $\frac{3}{4}$  in. to 3 in.; Flanged,  $\frac{3}{4}$  in. to 3 in.

**Jenkins Extra Heavy Pattern Gate Valves:** For 250 lbs. steam working pressure or 400 lbs. oil, water, gas working pressure. Sizes, inside screw: Screwed,  $\frac{1}{4}$  in. to 3 in.; Flanged,  $\frac{3}{4}$  in. to 3 in. Sizes, O. S. & Y.: Screwed,  $\frac{3}{4}$  in. to 3 in.; Flanged, 1 in. to 3 in.

## JENKINS IRON BODY GLOBE, ANGLE, CROSS VALVES



Fig. 141  
Globe, Screwed

These valves are bronze mounted with renewable bronze seat ring and Jenkins Composition Disc.

**Standard Pattern:** For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure. (See Fig. 141.)

**Medium Pattern:** For 175 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure.

**Extra Heavy Pattern:** For 250 lbs. steam working pressure or 400 lbs. oil, water, gas working pressure.

## JENKINS IRON BODY BRONZE MOUNTED GATE VALVES WITH HUB ENDS AND SQUARE STEM NUT



Fig. 883

Double Disc or Solid Wedge

Conform to specifications of the American Water Works Association. Double Disc or Solid Wedge—For 175 lbs. water working pressure. Tested to 300 lbs. hydraulic pressure. Sizes: 2 in. to 48 in.



Fig. 327

## JENKINS IRON BODY REGRINDING GLOBE, ANGLE, AND CHECK VALVES



Fig. 890  
Globe

For 150 lbs. steam working pressure, or 250 lbs. oil, water, gas working pressure. Sizes:  $\frac{3}{8}$  in. to 2 in.

These valves are regularly furnished with renewable nickel-alloy seat ring and disc. Bronze or stainless steel seat ring and disc can be supplied if so specified. These valves are of the union bonnet type; the body of high test cast iron; the spindle of manganese bronze; the wheel of the ball-type enameled green.

## JENKINS IRON BODY CHECK VALVES



Fig. 151  
Standard Pattern  
Horizontal,  
Screwed

**Standard Pattern:** For 150 lbs. steam working pressure or 250 lbs. oil, water, gas working pressure.

**Extra Heavy Pattern:** For 250 lbs. steam working pressure or 350 lbs. oil, water, gas working pressure.



Fig. 294  
Standard Pattern  
Swing Check,  
Screwed

## JENKINS IRON BODY UNDERWRITERS' GATE AND SWING CHECK VALVES



Fig. 825  
Flanged Outside  
Screw and Yoke

For 150 lbs. water working pressure. Sizes: Gate Valves, 2 in. to 48 in.; Check Valves, 2 in. to 12 in.

Carry the approval of the National Board of Fire Underwriters and the Associated Factory Mutual Fire Insurance Companies, and are suitable for water working pressure up to 150 lbs. They are marked "FM" and "JU."

## JENKINS IRON BODY BRONZE MOUNTED Y OR BLOW-OFF VALVES

**Standard Pattern:** For 150 lbs. steam working pressure, or 250 lbs. oil, water, gas working pressure. Sizes: Screwed, 2 in. to 3 in.; Flanged, 2 in. to 3 in.

**Extra Heavy Pattern:** For 250 lbs. steam working pressure, or 400 lbs. oil, water, gas working pressure. Sizes: Screwed, 2 in. to 3 in.; Flanged, 2 in. to 3 in.

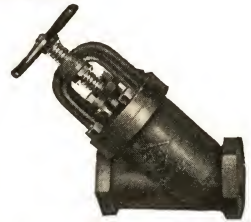


Fig. 296  
Standard Pattern, Screwed

## JENKINS IRON BODY BRONZE MOUNTED, SOLID WEDGE GATE VALVES

Each of these Jenkins Iron Body Gate Valves is individually tested, identified and certified. Each is manufactured to the high standard of Jenkins quality which is your assurance of valve satisfaction.



Fig. 325  
Inside Screw,  
Screwed

**Standard Pattern:** 2 to 16 in. for 125 lbs. steam working pressure; 200 lbs. oil, water, gas working pressure; 18 to 24 in. for 100 lbs. steam working pressure; 175 lbs. oil, water, gas working pressure. (See Fig. 325.)

**Medium Pattern:** For 175 lbs. steam working pressure or 300 lbs. oil, water, gas working pressure. (See Fig. 253.)

**Extra Heavy Pattern:** For 250 lbs. steam working pressure or 500 lbs. oil, water, gas working pressure.



Fig. 253  
Outside Screw  
and Yoke,  
Flanged

## JENKINS IRON BODY BRONZE MOUNTED DOUBLE DISC PARALLEL SEAT GATE VALVES

**Standard Pattern:** For 200 lbs. oil, water, gas working pressure at 150° F.; 400 lbs. test pressure.

**Extra Heavy Pattern:** For 500 lbs. oil, water, gas working pressure at 150° F.; 1000 lbs. test pressure.

## JENKINS COMPOSITION DISCS

Made of finest ingredients, compounded and vulcanized with extreme accuracy. Numerous compounds, each suited for a particular service. Guaranteed when used in service specified.

**Ready-reference Chart for Jenkins Discs:** For cold water, air and gas up to 10 lbs. pressure, Disc No. 30; 10 to 25 lbs. pressure, Disc No. 15; up to 50 lbs. pressure, Disc No. 946; 50 to 250 lbs. pressure, Disc No. 936.

For cold water, 250 to 400 lbs. pressure, Disc No. 110.

For hot water to 200° up to 50 lbs. pressure, Disc No. 936; 250° up to 250 lbs. pressure, Disc No. 110.

For hot water to 300°, Disc No. 80-A.

For steam up to 100 lbs. pressure, Disc No. 80-A.

For wet steam 150 lbs. pressure not over 366°, Disc No. 119.

For oil not over 100° to 50 lbs. pressure, Disc No. 946; not over 100°, 50 to 100 lbs. pressure, Disc No. 936; not over 150° to 200 lbs. pressure, Disc No. 1120. Temperatures recommended are Fahrenheit.

## JENKINS SHEET PACKING

**Jenkins '96:** Unvulcanized rubber sheeting for saturated steam joints under high or low pressure.

**Jenarco:** Red rubber sheeting, tough and pliable, suitable for steam, hot or cold water, etc.

**Oiltite:** Specially compounded for joints in lines carrying gasoline, kerosene, crude oil, etc.

## JENKINS PUMP VALVES

A few of the Jenkins service-tested compounds:

**No. 80-A:** For hot water temperatures 180° to 300°.

**No. 88:** For warm water up to 175 lbs. pressure.

**No. 936:** For cold water pressures up to 175 lbs.

**No. 946:** For cold water, low pressures.

## JENKINS ASBESTOS JOINTING

For high pressure and superheated steam and other severe services. Proof against heat, steam, water, oils, acids, and alkalis.



# JOHNS-MANVILLE

EXECUTIVE OFFICES

22 E. 40TH ST., NEW YORK, N. Y.

*Manufacturers of Insulations, Packings, Refractory Cements,  
Industrial Friction Materials and Building Materials*

Offices in All Large Cities

## JOHNS-MANVILLE REFRACTORY CEMENTS

Over twenty years ago the first refractory cement was marketed by Johns-Manville. Since then service conditions have become more rigorous and more diversified and the demands placed upon refractory materials more complicated. One cement no longer serves. Today Johns-Manville is able to offer a wide range of cements for an equally wide range of conditions of service—and they offer it through the most completely organized distribution system available. There is a refractory cement distributor in each of over 200 cities and towns in the United States. The cement you need is as close as your nearest telephone.

Out of the entire J-M Refractory line there are four items which meet the requirements of the bulk of refractory work for bonding, washcoating, shallow patching and monolithic construction.

These four are J-M No. 31, J-M No. 32, J-M Hellite and J-M Firecrete, the applications of which are described below. Details on these and other J-M Refractories are given in the complete table below.

**For Brick Setting with Bond or Cushion Joints:** For this purpose we recommend J-M No. 31 Cement. It makes an excellent joint of from  $\frac{1}{8}$  to  $\frac{3}{16}$  in. thickness where a heat setting dry cement is desired. The brick is well protected and the wall is permanently bonded.

Mixed with water J-M No. 31 Cement develops exceptional plasticity and remains well in suspension in the mixing box. Aluminum silicate base; vitrifies at 1450° F. and can be used up to 3100° F. Where a washcoat is used over a wall set with this cement, use J-M No. 32.

**For Brick-to-Brick Joints and Washcoating with a Dry Cement:** This type of joint requires a finer grained cement—J-M No. 32, also heat setting. As a mortar J-M No. 32 has excellent plasticity, handles easily and stands well in suspension. It is an excellent washcoating for brickwork set with J-M No. 31 or No. 32 cement.

It fills in cracks and pores and materially retards deterioration. Aluminum silicate base, vitrifies at 1250° F. and useful up to 3100° F.

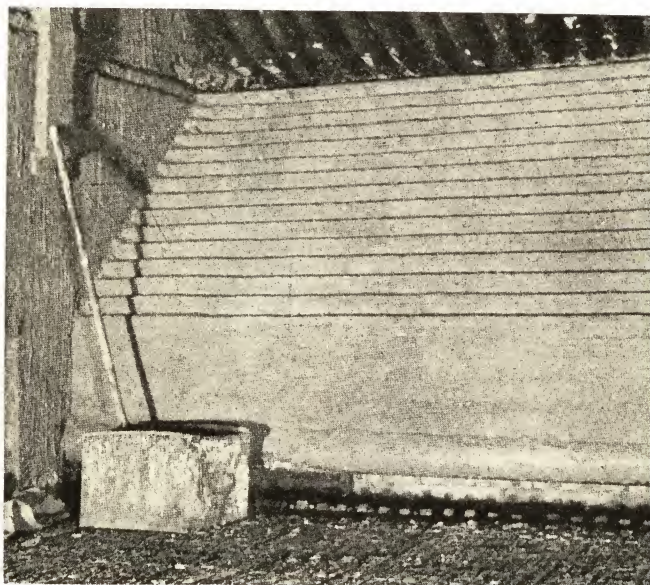
**For Brick Setting and Washcoating with a Ready-Mixed Cement:** The best material for these purposes is J-M Hellite, an air setting cement which is also highly recommended for hot patching with paddle or gun. It has high adherence, minimum shrinkage and will not "bloat." The temperature limit for Hellite is 3000° F. It is shipped in drums with the convenient full diameter removable head.

**For Monolithic Refractory Construction:**

J-M Firecrete which comes in two types, Standard and H. T. (High Temperature), is a dry, hydraulic setting refractory cement used for monolithic construction. Handled like an ordinary concrete mixture, it becomes available for a wide range of industrial applications. It is especially suited for poured or cast special shapes, door and flue linings, furnace ducts, etc. It has been used successfully to replace construction which was tedious or difficult to carry out with standard fire brick. J-M Firecrete has exceptional spall resistance and it does not shrink as it dries. Temperature limit with H.T. Firecrete 2800° F. and with Standard Firecrete 2400° F.

Firecrete can be used either as a poured or tamped lining. In six hours drying it sets sufficiently to permit removal of forms. The material should be cured for a period of from 12 hours to 3 days before heat is applied.

**Other J-M Recommendations:** For cement gun application, J-M No. 26 or Hellite; for heavy patching, P. F. B. M.; for setting silicon carbide brick, J-M No. 30; for rammed linings in electric furnaces, J-M No. 34; for Detroit electric furnaces, J-M No. 33; for unusually severe conditions, J-M No. 35.



J-M Refractory Cements, for Bonding and Washcoating,  
Lengthen the Life of Boiler Walls

### TECHNICAL DATA ON J-M REFRACTORY CEMENTS

Cement	Character or Base	Highest Working Temperature Deg. F.	Lowest Working Temperature, Deg. F.	Pounds Needed to Set 1000 Brick	Pounds Needed for 1 Cu. Ft. of Construction	Form in Which Cement Is Shipped	Size of Bags, Cans or Drums, Pounds
Hellite	Al Silicate	3000	Air Setting	400†		Ready Mixed	100, 240, 485, 800‡
No. 32	Al Silicate	3100	1250	400†		Dry	100
No. 31	Al Silicate	3100	1450	600*-700*		Dry	100
Std. Firecrete	Al Silicate	2400	Air Setting		110	Dry	100
H. T. Firecrete	High Alumina	2800	Air Setting		115	Dry	100
No. 20	Silica	2700	Air Setting	400†		Ready Mixed	100, 250, 500, 850‡
No. 26	Al Silicate	2900	Air Setting	600*-700*		Dry	100
No. 30	Si. Carbide	3000	1450	800*		Dry	100
No. 33	Kaolin	3300	1250	750*	130	Dry	100
No. 34	Chrome	3400	Air Setting	600	200	Dry	100
No. 35	High Alumina	3500	1200	750*		Dry	100
P. F. B. M.**	Al Silicate	3100	1500		133	Ready Mixed	100, 250, 500

\* The figure given is for a bond joint,  $\frac{1}{8}$ " to  $\frac{3}{16}$ " thick. Without asterisk, the quantities are for brick-to-brick joints. \*\* Plastic Fire Brick Material.

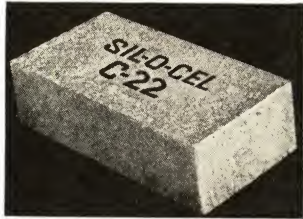
† Approximate quantities required for washcoating 100 sq. ft.: 35 lb. Hellite with 7 lb. water; 50 lb. No. 32 with 30 lb. water; 40 lb. No. 20 with 7 lb. water.

‡ Also furnished in 25 and 50 lb. containers and, in the case of No. 20, in 5 and 10 lb. cans.



## JOHNS-MANVILLE INDUSTRIAL INSULATIONS

JOHNS-MANVILLE provides insulating materials for use throughout the entire range of industrial process temperatures. A few of these products are briefly described below.



**Sil-O-Cel Insulating Brick:** Three types of Sil-O-Cel Insulating Brick are available: Sil-O-Cel Super Brick (calcined) for temperatures as high as 2500° F., Sil-O-Cel C-22 Brick (calcined) for temperatures up to 2000° F., and Sil-O-Cel Natural Brick for temperatures to 1600° F. These three types of Sil-O-Cel Brick are ordinarily used in

back of fire brick linings in boilers, still furnaces, heat treating furnaces, kilns and other types of high temperature equipment.

Sil-O-Cel C-22 Brick is also used as an insulating refractory for lining furnaces up to 2000° F. In this service it reduces operating costs, improves performance and permits thinner furnace wall construction. It is not recommended in furnaces where it may be subjected to erosion or slagging action. On intermittent furnaces it also effects large savings in heat capacity losses during shut-downs, due to its low heat absorption.

All types of Sil-O-Cel Brick are furnished in standard fire brick size, 9 x 4½ x 2½ in., and as No. 1 and No. 2 arch brick. Sil-O-Cel Natural Brick are also supplied in 1½, 2 and 3-in. thicknesses. Sil-O-Cel C-22 Brick are also furnished in a wide variety of shapes. Packed in fibre cartons of 25 9-in. straight brick or an equivalent volume of other sizes. Special mortar furnished for laying.

**Sil-O-Cel C-3:** A calcined material used as an insulating filler for temperatures as high as 2000° F. When mixed with portland cement, producing Sil-O-Cel C-3 concrete, it may be cast in any desired form and used for lining furnace doors, insulating furnace bases and for a wide variety of other purposes, where a semi-refractory insulating concrete is required which will withstand temperatures up to 1800° F.

**Superex Blocks:** (For temperatures to 1900° F.) Superex insulation is a most adaptable and highly efficient material for insulating boilers, furnaces, etc., where the insulation must resist temperatures between 600° F. and 1900° F. It is the outstanding block insulation for high temperatures.

Furnished in standard sizes 3 x 18 in. and 6 x 36 in., flat and curved, in thicknesses 1 to 4 in. Other sizes furnished on special order. Weight approximately 2 lb. per sq. ft., 1 in. thick. Often used as the first layer of Superex Combination Insulation with an outer layer of 85% Magnesia Blocks. Also furnished in sectional form for pipe insulation.

**85% Magnesia Blocks:** (For temperatures to 600° F.) J-M 85% Magnesia Insulation is well known as one of the most efficient commercial insulations.

Furnished in standard sizes 3 x 18 in. and 6 x 36 in., flat and curved, from ½ to 4 in. in thickness. Other sizes furnished on special order. Weight approximately 1.4 lb. per sq. ft., 1 in. thick. Also furnished in sectional form for pipe insulation.

### RECOMMENDATIONS FOR BLOCK INSULATION ON HEATED METAL SURFACES

Maximum Temperature on Superex, Deg. F.	Thickness of Superex, In.	Thickness of 85% Magnesia, In.	Total Thickness of Block Insulation, In.
300	...	2	2
400	...	2½	2½
500	...	3	3
600	...	3½	3½
750	1½	2½	4
900	2	2	4
1000	2½	2	4½
1200	3½	1½	5

**Rock Cork Sheets and Lagging:** (For temperatures below 100° F.) J-M Rock Cork is an efficient insulating material for

cold storage construction and refrigerating equipment. Manufactured from rock wool combined with a waterproof binding ingredient, moulded into sheets.

Standard size sheets are 18 x 36 in. and 1½, 2, 2½, 3 and 4 in. thick; also 18 x 18 x 1 in. Lagging is furnished for diameters from 11 in. to 20 ft. and is supplied 18 in. long, in thicknesses of 1½, 2, 3 and 4 in. and from 2 to 5 in. wide, depending upon diameter of cylinder. Weight approximately 1.25 lb. per sq. ft., 1 in. thick.

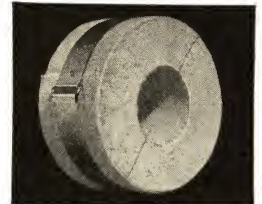
**Superex Combination Pipe Insulation:** Superex Pipe Insulation is manufactured from the same material as Superex Blocks. It has been used in many of the largest power plants built in recent years where every precaution was taken to insure maximum economy. Superex is generally used as a first layer against the heated surface and covered with an outer layer of Asbesto-Sponge Felted or 85% Magnesia. Materials are furnished in standard sizes for this purpose.

### SUPEREX COMBINATION PIPE INSULATION RECOMMENDATIONS

Temperatures	600-699° F.		700-799° F.		800-1000° F.	
	Pipe Size, In.	Thick-ness of Superex, In.	Thick-ness of 85% Magnesia or Asbesto-Sponge Felted, In.	Pipe Size, In.	Thick-ness of Superex, In.	Thick-ness of 85% Magnesia or Asbesto-Sponge Felted, In.
1½ and smaller..	2	1½	2	2	2	1½
2	1¼	1½	1¼	2	1½	1½
2½	1¼	1½	1¼	2	1½	1½
3	1¼	1½	1¼	2	1½	1½
3½	1¼	1½	1¼	2	1½	1½
4	1¼	1½	1¼	2	1½	1½
4½	1¼	1½	1¼	2½	1½	1½
5 and larger, approx.	1½	2	1½	2½	2	2

**Asbesto-Sponge Felted Pipe Insulation:** (For temperatures to 700° F.) Asbesto-Sponge Felted Pipe Insulation is the most efficient insulating material obtainable in sectional form for temperatures up to 700° F. It is built up of laminated asbestos felts in which are embedded small particles of a spongy cellular material. It has unusual mechanical strength and is used where the insulation may be subjected to severe usage or vibration.

Furnished in 3-foot sections in thicknesses from the standard (approximately 1 in.) to 3 in., to fit any commercial size of steam pipe.



**85% Magnesia Pipe Insulation:** (For temperatures to 600° F.) J-M

85% Magnesia Pipe Insulation has become definitely established as the best insulating material for general use within its temperature range.

Furnished in 3-foot sections or segments, depending on size, and in the following thicknesses; Standard, 1½, 2, 2½ in., Double Standard, and 3 in., broken joint, to fit all standard pipe sizes.

### PIPE INSULATION RECOMMENDATIONS FOR MAGNESIA OR ASBESTO-SPONGE FELTED

Thickness of Insulation, Magnesia			Temperature, Deg. F.	Thickness of Insulation, Asbesto-Sponge Felted		
Pipes Larger than 4 In.	Pipes 2 In. to 4 In.	Pipes Smaller than 2 In.		Pipes Larger than 4 In.	Pipes 2 In. to 4 In.	Pipes Smaller than 2 In.
Std.	Std.	Std.	Room to 211	1"	1"	1"
Std.	Std.	Std.	212 to 266	1"	1"	1"
1½"	Std.	Std.	267 to 337	1½"	1"	1"
2"	1½"	Std.	338 to 387	2"	1½"	1"
Dbl. Std.	2"	1½"	388 to 499	2½"	2"	1½"
3"	Dbl. Std.	2"	500 to 599	3"	2½"	2"
			600 to 700	3½"	3"	2"

In addition to the above, Johns-Manville also furnishes many other types of insulating blocks, sheets and blankets; sectional pipe insulation; insulating cements, fillers and finishes; and insulating paper and felts. There is a J-M product for every heat insulating purpose.

(Continued on next page)



## JOHNS-MANVILLE PACKINGS

**Standardized Packings:** JOHNS-MANVILLE manufactures an individual packing to meet every packing requirement. In ordinary usage, however, major economies may be effected by standardizing stocks and eliminating unnecessary styles and sizes which is easily possible with the J-M line. Thus capital investment is lowered, errors are avoided, handling and storage costs are reduced and packing problems simplified.

**J-M Sea Rings:** Sea Rings for reciprocating rods and plungers, where the packing space is not less than  $\frac{5}{16}$  in. and the rod is  $\frac{3}{4}$  in. diameter or more, are adapted for service against steam, hot or cold water, air, gas, brine or vegetable oils. The pressure of the fluid automatically adjusts the flexible lip to prevent leakage. Unnecessary friction is eliminated, rod wear reduced and power conserved.

**Rod and Plunger Packings:** Kearsarge Rod and Plunger Packing in spiral ring or coil form is designed for use against steam, air and gas up to 500° F., where packing space is  $\frac{3}{8}$  in. or more.

**J-M Flax Packings:** J-M Flax Packing, furnished in several styles for high and low pressure work, is the best manufactured for use against cold water and brine.

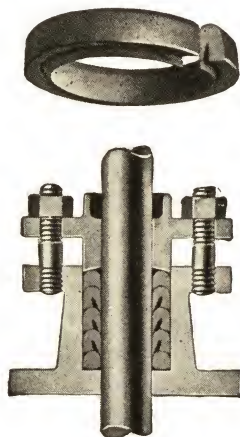
**Packings for Centrifugals:** J-M Semi-Metallic

or Centripac packings are particularly designed for use on centrifugal pumps, against water, steam, oil, ammonia and brine, and may also be used on rotating or oscillating rods.

**Sheet Packings and Gaskets:** No. 60 Service Sheet is made for use on flat surfaces for packing against steam, gas, air, water and ammonia. It is furnished  $\frac{1}{64}$  in.,  $\frac{1}{32}$  in.,  $\frac{1}{16}$  in. and  $\frac{1}{8}$  in. in thickness. Liberty Red Rubber Sheet is used on service water. Furnished  $\frac{1}{32}$  in.,  $\frac{1}{16}$  in. and  $\frac{1}{8}$  in. in thickness. Additional sheet packings are available for hot and cold oil, chemicals, high temperature gases and all other conditions of service. Kearsarge Handhole and Manhole Gaskets are especially convenient around the boiler plant to make a dependable seal.

**Other J-M Packings:** Other famous J-M Packings include Besta-Monia, Jewett Ring, Mogul Coil, Universal Rod and Plunger, Universal Piston and Seigelite Sheet.

Rod, Outside-packed Plunger and Valve Stem Packing, Piston Packing, Sheet Packing and Gaskets for any service—every requirement is met by some J-M product specially designed to serve the purpose.



J-M Sea Ring

*Write for the J-M Packing Catalogue.*

## JOHNS-MANVILLE INDUSTRIAL FRICTION MATERIALS

Johns-Manville has served industry for many years with a complete line of dependable industrial friction materials. The production of these friction materials requires an experienced force of technicians and workmen, a thoroughly equipped laboratory for research and tremendous manufacturing facilities. J-M Brake Linings and Clutch Facings have established new records for maintenance and power economies when applied to hoists, winches, shovels, draglines, aerial tramways, inclined planes, cranes and other equipment used in industry.

J-M Industrial Friction Materials are of both the rigid and flexible types. The rigid type, which includes Asbesto-Metallic Friction Blocks and Moulded Lining, are noted for mechanical strength, uniformity of friction, smooth, quiet operation and long life on severe service at low or average speed. The flexible type is more adaptable to all sizes of drums. Both types possess to an unusual degree the three fundamentals required of a friction material in industry—heat resistance, mechanical strength and durability.

**J-M Folded and Compressed Lining, Type No. 600:** The best general utility lining yet to be offered to industry. It is a readily formed, flexible and strong material, adaptable to average speed, shock load conditions. It will resist temperatures up to 600° F. very satisfactorily and the frictional value stays within reasonable limits through a wide range of temperature. Type No. 600 Lining has a very low rate of wear, considerably below the rate of wear of either woven or moulded materials. It has a wide range of application and is adapted for field replacement, especially on worn drums. Type No. 600 Lining is formed of asbestos cloth woven from brass wire-inserted yarns. The cloth is coated both sides with a heat-resisting compound, folded to required size, hydraulically pressed and cured by heat.

**J-M Asbesto-Metallic Friction Blocks, Types No. 100 and 120:** Materials of the rigid class made from asbestos, brass wire and rubber composition, hydraulically formed in a mould and cured

by heat and pressure to required shape. The difference in type lies primarily in their friction value which is modified by changing the composition of the block, chiefly by adding graphite.

**J-M Moulded Friction Lining, Types No. 200 and 220:** Moulded linings of the rigid class and of practically the same composition as the block material. However, the material is readily adaptable to wrap bands, either internal or external. The difference in type lies primarily in their friction value.

Asbesto-Metallic Blocks and Moulded Lining, because of their high mechanical strength, are particularly adaptable to low or average speed and severe shock service where there is a tendency to crush or shear the friction material due to sudden application of heavy loads. Where temperature is a factor these materials should always be used as they have very high heat resistance. The coefficient of friction of these materials remains remarkably constant through a wide range of temperature.

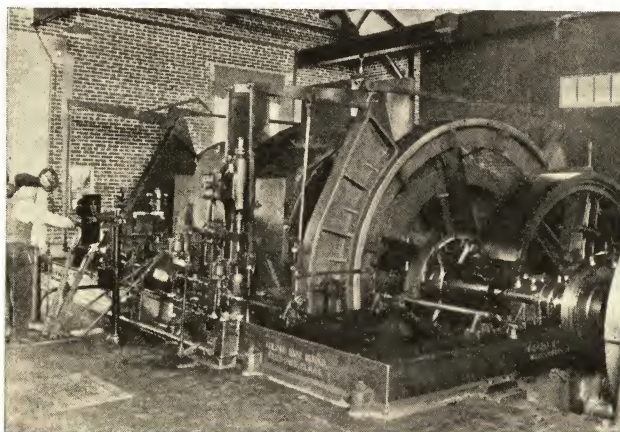
Types No. 100 and 200 are most satisfactory for cast-iron surfaces. Types No. 120 and 220 are more applicable to steel friction surfaces as they have less scoring tendency on steel. Sketches and accurate dimensions are necessary when ordering rigid materials.

**Other J-M Friction Materials:** Johns-Manville has a complete line of Woven Brake Linings that are designed for dry, limited

oil, or full oil service, for low or high temperature and for light or severe loads.

Clutch facings for both cone and disc clutches can be made from any of the above mentioned materials.

**J-M Friction Material Recommendations:** Complete recommendations on the selection and application of industrial friction materials are contained in brochure FM-3A, sent on request. Johns-Manville is in a position to give full engineering service on all Friction Material problems.



J-M No. 600 Lining on a Colliery Hoist



# THE M. W. KELLOGG COMPANY

225 BROADWAY, NEW YORK, N. Y.

*Manufacturers of Industrial and Central Station Piping Systems and Pressure Vessels*

WORKS: JERSEY CITY, N. J.

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SAN FRANCISCO, CAL.

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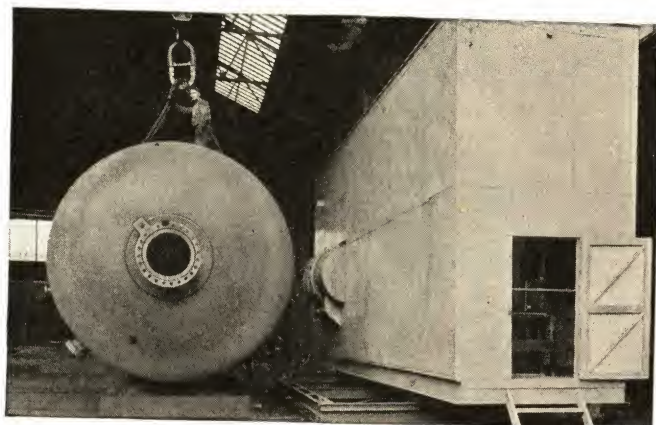
LOS ANGELES, CAL.

CANADIAN KELLOGG CO., LTD., MONTREAL, TORONTO, WINNIPEG, CANADA

## KELLOGG "MASTERWELD" PRODUCTS:

Include products such as receivers, separators, receiver-separators, headers, boiler drums, autoclaves, evaporator towers, bubble towers and kindred vessels.

All Kellogg "Masterweld" products comply with the A.S.M.E. Boiler Construction Code.



Kellogg Pressure Vessel in Position Before X-Ray Machine

The "Masterweld" deposited metal is tough, ductile and strong, with physical properties equal or superior to those of base metal, and is guaranteed to possess minimum tensile strength of 60,000 lb., a minimum yield point of 30,000 lb. and 30% elongation of outer fibres in a free bend test. Weld is free from oxides and other impurities.

Kellogg pressure vessels are designed to avoid structural weakness of earlier types and to provide an absolutely tight structure at all times. High grade open hearth welding quality steel is used throughout and special care is taken in heat treatment to insure all strain removal.

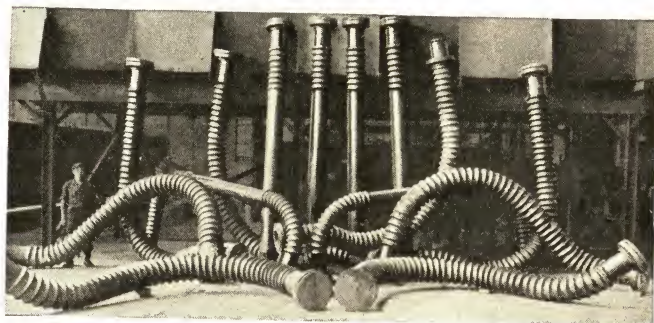
Kellogg "Masterweld" boiler drums are designed to meet the problems presented by high pressures and temperatures found in central stations and large industrial power plants. They are free from laps, riveted butt straps, and the cold working strains to be found in vessels of riveted construction.

## ALLOY STEEL FABRICATION:

Complete facilities for fabrication and heat treatment of alloy steel vessels and piping to withstand high or low temperatures and severe corrosive conditions are available in the Kellogg shops.

## KELLOGG CORRUGATED PIPE BENDS AND TANGENTS:

Eliminate excessive joint stress and permit maximum runs of piping, with a flexibility of from 3 to 5 times that of a plain bend or tangent and reduce to a minimum the amount of space required. Much lower stresses are imposed on a joint with an increase in expansion allowance. Available in all economical sizes. Kellogg "Masterweld" pipe or seamless tubing is used exclusively.



Kellogg Corrugated Bends

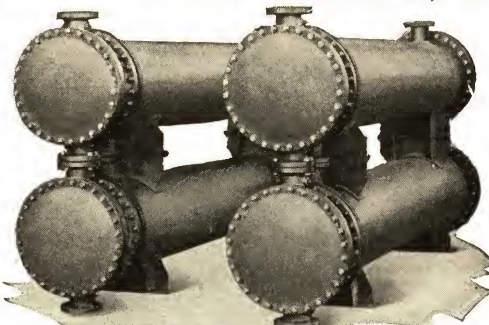
## KELLOGG PIPING SYSTEMS:

The M. W. Kellogg Company for many years has specialized in the design, fabrication and installation of complete piping systems for central stations and industrial plants. In connection with piping, the Van Stone joint can be furnished in 100%, 150% and 200% lap thickness, and the tongue and groove joint up to 200% of nominal pipe thickness. The Van Stone is an eminently satisfactory joint for medium pressures, and with such modifications as the double groove or Sarlun type is suitable for any of the pressures now generally used. The double groove Sarlun and Van Stone joints are full machined to rigid tolerances.

## KELLOGG HEAT EXCHANGERS:

Offer the most advanced design and construction for efficiently conserving heat through the interchange of temperatures between gases or liquids in chemical plants, petroleum refineries, etc.

They are fabricated in different types with fixed or removable tube bundles and baffles arranged as conditions may determine. The design has been so standardized through the many years the M. W. Kellogg Company has been building heat transfer equipment as to permit of their application to a wide range of conditions.



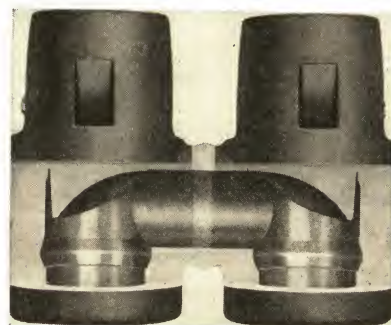
Four Sectioned Kellogg Heat Exchanger

## KELLOGG "SMOOTH-FLOW" RETURN HEADERS:

Kellogg "smooth-flow" return headers can be furnished in all standard sizes, of regular carbon steel or of 4-6% chrome with .5% molybdenum or 1% tungsten. This choice of steels covers practically all header requirements of the oil and process industries.

In the Kellogg "smooth-flow" return header the body is composed entirely of forged material with the consequent soundness, toughness and reliability commonly found in a forging.

Inquiries on headers should include data regarding furnace tube diameter, center to center dimensions of tubes and the material preferred.



Kellogg "Smooth-Flow" Return Header

## KELL-RAPH GASKETS:

Kell-Raph Gaskets are seamless steel rings, plated with copper, silver, gold, platinum or any other soft metal that will resist the action of the fluid to be handled. They produce a high unit gasket pressure, the steel core withstanding the stress and the soft plating metal providing the yielding properties necessary for joint tightness.

## LITERATURE:

Literature giving more complete details of the various Kellogg products will be sent on request.



# E. KEELER COMPANY

Established 1864

MAIN OFFICE AND SHOPS: WILLIAMSPORT, PA.

Branches in All Principal Cities

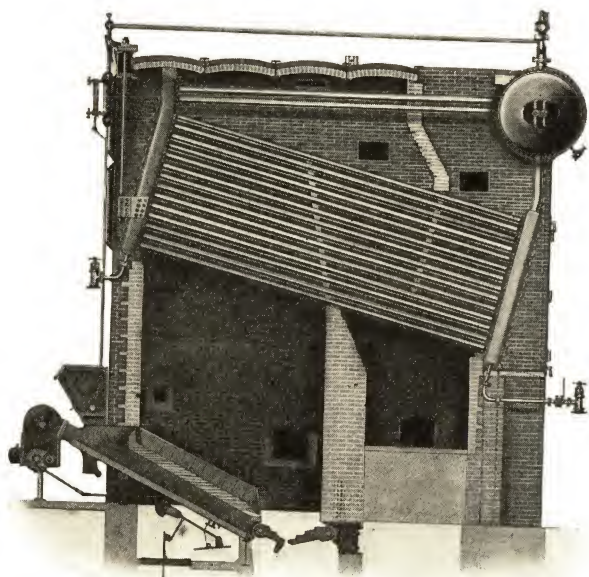
## PRODUCTS:

Straight Tube and Bent Tube Water Tube Boilers; Water Walls; Preheaters; Economizers; Horizontal Return Tubular and Double Duty Boilers; Steel Breechings, Stacks, Tanks and Casings.

**Undivided Responsibility:** When desired we will contract to make a complete installation of boilers, brick work, stokers, oil burners, pulverizers, water walls, superheaters, air preheaters, soot blowers, stack and breeching. We maintain a staff of experienced erecting engineers.

## KEELER STRAIGHT TUBE WATER TUBE BOILER:

Keeler longitudinal drum and cross drum water tube boilers present an unusually complete combination



Typical Setting 822 Hp. Cross Drum Boiler with Forced Draft Stoker

of features that have been universally recognized as desirable in high pressure steam boilers. They combine absolute safety, simplicity and durability, with the highest possible efficiency.

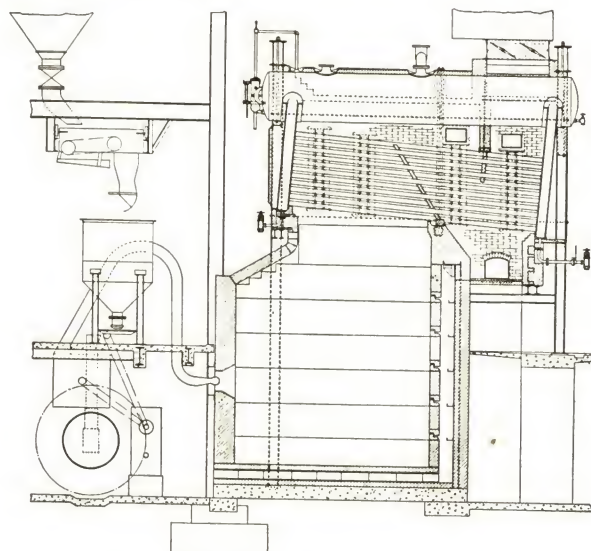
The Keeler cross drum water tube boiler was developed to meet the demand for a high pressure straight tube water tube boiler that could be installed where ceiling height is limited, or where the boiler must be introduced through narrow passageway or restricted openings.

The tubes in both the Cross Drum and Longitudinal Water Tube Boilers are straight and are inclined so as to properly influence the direction of circulation. They are in horizontal and staggered vertical rows and are expanded into headers.

The headers are all wrought steel construction which provides equal expansion by maintaining uniformity of temperature of the water within the boiler. Rivets

where used are protected by water on one end. There are no rivets on the fire side of the headers.

The drums are usually rolled from a single plate eliminating girth seams. The manhole opening is placed in the drum head.



Typical Powdered Fuel Installation  
500 Hp. Long Drum Boiler with Air Cooled Walls

Feed water is introduced into the boiler through the drum head and is piped into a submerged mud drum where it deposits the heavier impurities before entering the boiler circulation.

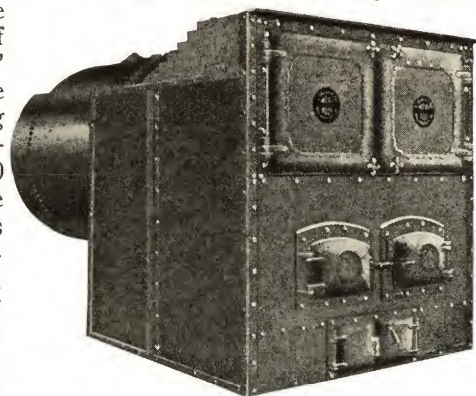
Blow off connections are provided from the internal mud drum and from the bottom of the boiler header or water leg.

The front end of a Keeler straight tube water tube boiler is suspended from overhead girders which rest on steel columns placed at the outside corners of the boiler setting. Method for support of rear end is optional.

Cast iron or cast steel is never used for pressure purposes in Keeler Boiler construction.

## KEELER DOUBLE DUTY BOILER:

Designed for power or heating purposes. Its construction differs materially from that of any similar type. It is the product of over 70 years' experience in building boilers. During this 70 years in one line of business we have accumulated a background of experience that is always at the service of our customers.



Keeler Double Duty Boiler  
A Semi Self Contained Type Fire Tube Boiler



## E. KEELER COMPANY

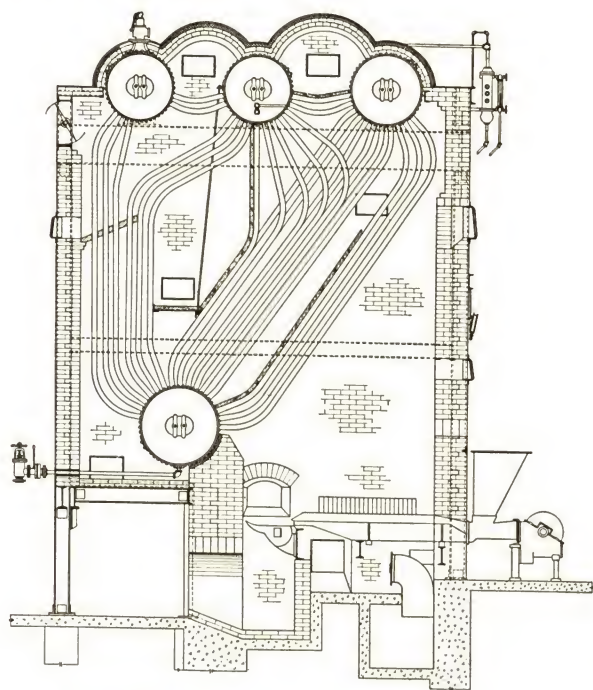
### KEELER BENT TUBE WATER TUBE BOILERS:

The illustrations on this page show a few of the combinations of steam and water drums connected by curved tubes to meet various conditions.

The Keeler Type "DC" Boiler is recommended for Central Station Plants and plants where steam demands are intermittent and rapidly fluctuate from rating to large over ratings.

Your attention is invited to the way the tubes are arranged to provide a multiple circulation within the boiler. With this multiple circulation steam liberation is not restricted to one drum and therefore the type "DC" produces dry steam.

There is a well defined circulation through all tubes and drums in Keeler Bent Tube Boilers and every section of the boiler is part of the steam generating system and not restricted to function as a preheater of feed-water or economizer.



Keeler Type "DC" 4 Drum Bent Tube Boiler

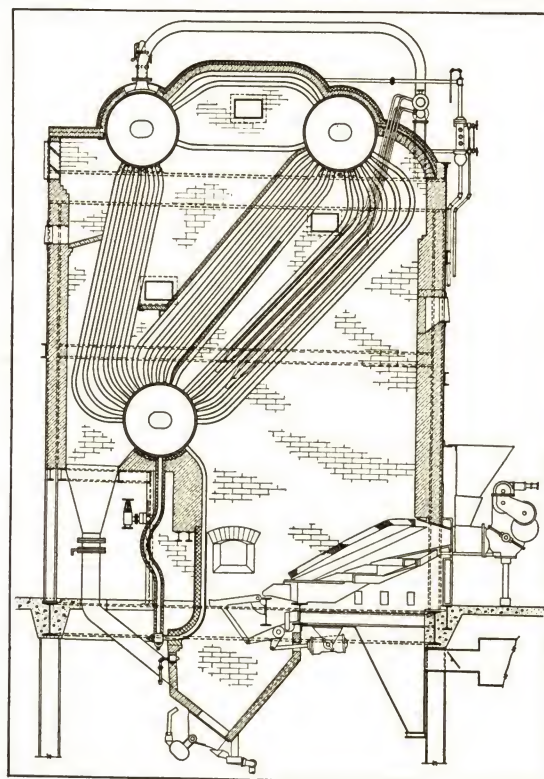
The three upper drums are not only connected by steam transfer tubes, but also with circulation tubes below the water level, which feature assures a uniform water level in all the upper drums and the operator can obtain a true reading from the water gauge.

Economizers will be furnished upon request at economizer prices.

The Keeler Type "P" Boiler differs from type "DC" only as to the number of boiler drums and arrangement of tubes. It is adaptable for use in power plants requiring steady steam supply, even at high ratings. The upper drums, like those of type "DC", are connected with steam transfer tubes, forming the setting roof arch, and with tubes below the water line to provide a circulation for the rear bank of tubes and serving to maintain an equal water level in the upper drums.

Superheaters of any make or design may be installed in Keeler Bent Tube Boilers without any change in the standard construction.

Roof Tubes and drums above the normal water level are NOT included as heating surface when calculating boiler horsepower.



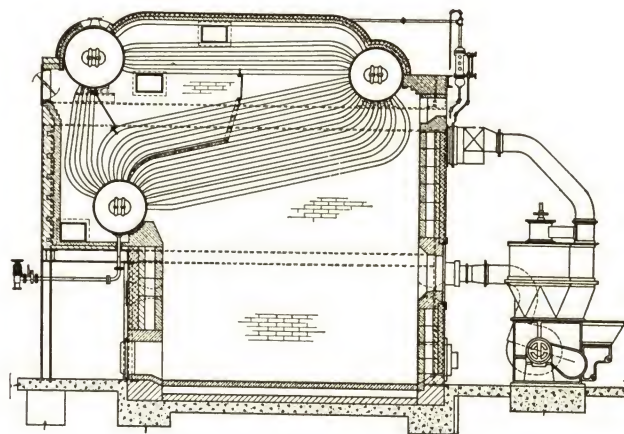
Keeler Type "P" 3 Drum Boiler

The tubes are full sized  $3\frac{1}{4}$  inches diameter bent to a long, easy radius. All tubes are carefully bent to a template and accurate records are preserved to insure correct replacements.

Any tube in a Keeler Bent Tube Boiler can be removed and replaced without disturbing any other tube or connection.

Arrangement of baffle walls and design of the furnace will be made to meet particular requirements of operation, fuel or furnace equipment to be installed.

Special care is given in the design of the structural steel supporting framework to guard against a construction which would not permit ample expansion of both the boiler and setting.



Keeler Type "J" 3 Drum Low Head Bent Tube Boiler

For plants where headroom is limited we suggest the use of Keeler type "J". It is built in units up to 5000 square feet of heating surface.



# KENNEDY-VAN SAUN MFG. & ENG. CORP.

2 PARK AVE., NEW YORK, N. Y.

Branch Offices and Representatives in All Principal Cities of the United States

SOUTH AFRICA: W. S. Thomas, 73 Cullinan Building, Johannesburg

CANADA: The William Kennedy & Sons, Ltd., Owen Sound, Ontario

EUROPE: Cie. des Entreprises Industrielles, 40 Rue des Mathurins, Paris, France

BRITISH ISLES: The Sheepbridge Coal & Iron Co., Limited, Bush House, London

AUSTRALIA: Walkers, Ltd., Maryborough, Queensland

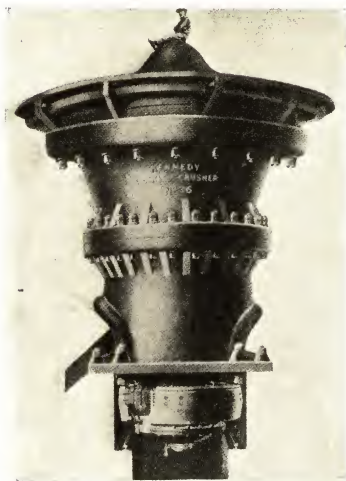
NEW ZEALAND: Booth, MacDonald & Co., Christchurch

## PRODUCTS

The Kennedy Line of Crushers, Cement Machinery, Elevators, Conveyors, Screens, Pneumatic Transport Systems, Pulverized Fuel Equipment, Air and Water-cooled Furnaces for boilers and metallurgical purposes is outstanding. Each machine is supreme in its respective field.

## KENNEDY SERVICE

All machine parts are made to gauge and template. Accuracy of manufacture, high-class workmanship, correct materials and design have entitled us to the slogan of "Machinery with the Troubles Left Out." Our illustrated and descriptive bulletins are really hand books and should be on the desk of every engineer.

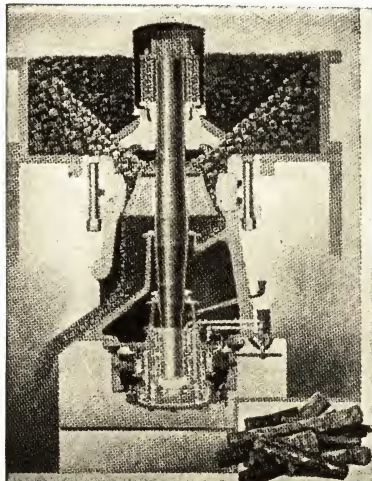


Primary Gearless Gyratory Crusher  
Receiving Openings 3" to 66".  
Weight 700 to 1,000,000 Lbs.

## PRIMARY GEARLESS GYRATORY CRUSHER

The only gyratory crusher where the dead weight is supported on ball bearings, and the entire energy applied to crushing the rock. It can be driven by a synchronous motor built in the pulley having a 200% starting torque and 250% pull out torque, thus enabling the starting of the crusher when it is full of rock, or it can be driven by a standard motor. In the event of the latter a V-belt drive is usually applied.

## SECONDARY GEARLESS GYRATORY CRUSHER

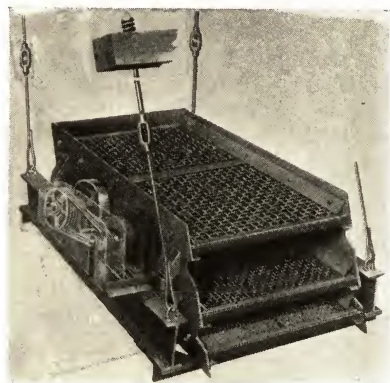


Secondary Gearless Gyratory Crusher  
Receiving Openings 1 3/4" to 14".  
Capacities 1/2 to 620 Tons per Hr.

In addition to the features described in previous paragraph the secondary crusher is equipped with a two-angle mantle and reversible top shell and concaves. As in the case of the primary crusher, the core and mantle are self-locking and no threads are cut in the shaft, thus making it 50% stronger. The head and shaft are supported on a nest of springs which can be compressed, permitting the head to move downward and allowing steel to pass without damaging the crusher. The capacities listed in our catalogue are usually materially exceeded.

## VIBRATING SCREEN

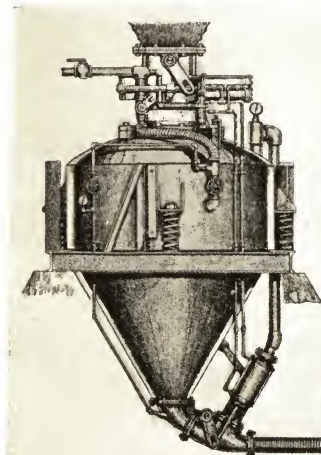
The Kennedy Vibrating Screen is a machine of high capacity, occupying a minimum of space, with low power consumption. It is built over a wide range of capacities, having screens of 1, 2, 3, or more decks. The classification of materials with this machine is, without doubt, the best of any machine on the market. It is suitable for stone, coal, and a large range of crushed products.



Vibrating Screen

## PNEUMATIC TRANSPORT SYSTEM

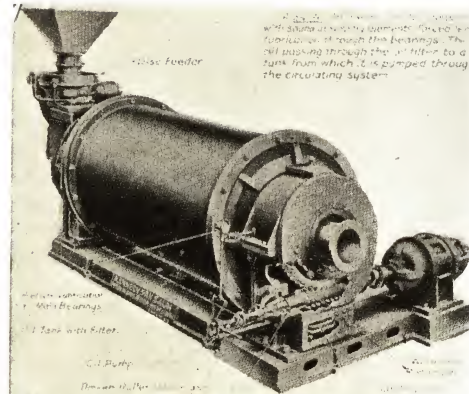
Ideal for transporting all kinds of powdered materials such as powdered and crushed coal, cement, etc., as well as sludges; also grain, seed, flour, etc. It has no screws, motors or other rotating parts. Its action is automatic, its power cost low and its maintenance negligible. Also built for mounting on trucks or railroad cars.



Pneumatic Transport System

## AIR-SWEPT TUBE MILLS

The Air-Swept Tube Mill is the ideal unit for either large or small plants. Its capacity ranges from 50 lbs. to 60,000 lbs. per hour, and is suitable for unit firing or bin storage. The tube mill is the "King of Fine Grinders" for all materials including carborundum, cement clinker, rock or ore. In power plants we have dealt successfully with lignite, bituminous and anthracite coal including Brazilian coal having more than 40% ash and high in pyrite, petroleum coke, pitch, etc. The mills are equipped with herringbone or worm gear drives and our patented sound absorbing elements, therefore suitable for schoolhouse, church, or hospital installations.



Worm-Driven Air-Swept Tube Mill



# KIELEY & MUELLER, INC.

Established 1879

34 WEST 13TH ST., NEW YORK, N. Y.

Engineering Specialties for Pressure and Level Control

FACTORY: NEWARK, N. J.

Agents in All Principal Cities

## PRODUCTS:

**VALVES:** Altitude, Stop and Check, Pressure Regulating, Float, Pilot Reducing, Back Pressure, Tank Control.

**LIQUID LEVEL CONTROLLERS:** Direct connected or remote control; Internal or external float. PUMP GOVERNORS, STEAM TRAPS, STRAINERS.

Also Damper Regulators, Hot Water Temperature Controllers, Oil Separators, Steam Separators, Return Traps, Water Columns, etc.

## ENGINEERING CO-OPERATION:

Our Engineering Department will be glad to co-operate in the selection of the proper device for individual service requirements.

The devices illustrated are only a few of the K. & M. line of specialties which are suitable for the most exacting requirements when used in connection with power, heating and plumbing installations.

A complete catalogue will be sent on request.

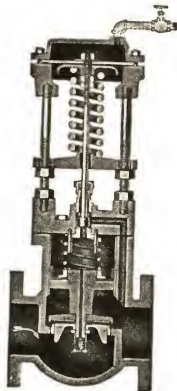
## PILOT REDUCING VALVE:

For regulation and reduction of high pressure steam to intermediate pressures. Bronze, cast steel or cast iron. Pilot is controlled by small feeler pipe which can be connected at point where the desired pressure is to be maintained.



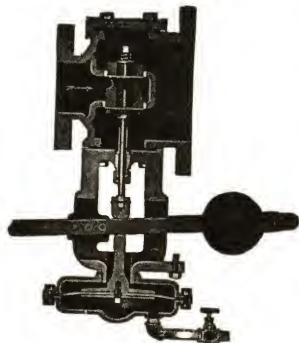
## ALTITUDE VALVE:

For controlling water level in elevated tanks and towers. Sensitive and positive in operation. The pilot is diaphragm operated and controlled by a small feeler pipe connected on the discharge side. Thoroughly cushioned when opening and closing to insure against water-hammer and shock. Construction of cast iron with bronze trim.



## PRESSURE REGULATING VALVE:

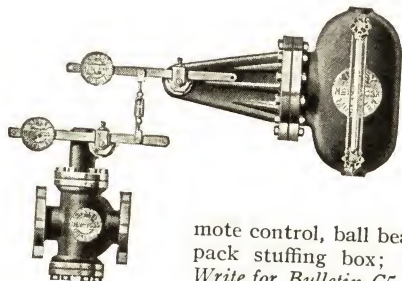
Spring and lever weighted valves for pressures up to 250 lb. and reduced pressures from 0 to three quarters of the initial pressure. Suitable for water, air and gas and controlled by a small feeler pipe connected from diaphragm to low pressure side. Bronze, cast steel or cast iron.



## LIQUID LEVEL CONTROLLERS:

For the accurate control of liquids in tanks or other vessels; suitable for use in gas-line plants, refineries; industrial plants. Direct connected or re-

mote control, ball bearing spindle and easy-to-pack stuffing box; rotary or sliding valve. Write for Bulletin C5.



Mechanical Catalog (1934-35)

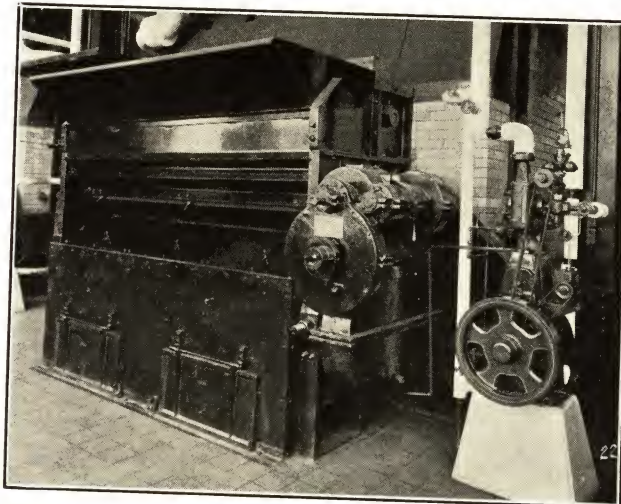
# LACLEDE STOKER COMPANY

4436-58 HUNT AVE., ST. LOUIS, MO.

Manufacturers of Chain Grate Stokers

## REPRESENTATIVES IN

CHICAGO . . . . .	113 S. Jefferson St.	J. G. Hope
DES MOINES . . . . .	910 Walnut St.	Fred Keating
INDIANAPOLIS . . . . .	4302 N. Capitol	R. F. Milburn
KANSAS CITY . . . . .	432 Dwight Bldg.	L. J. Osborne
NEW YORK . . . . .	39 Cortland St.	T. H. Burch, Jr.



Installation Forced Draft Stoker

## LACLEDE STOKERS

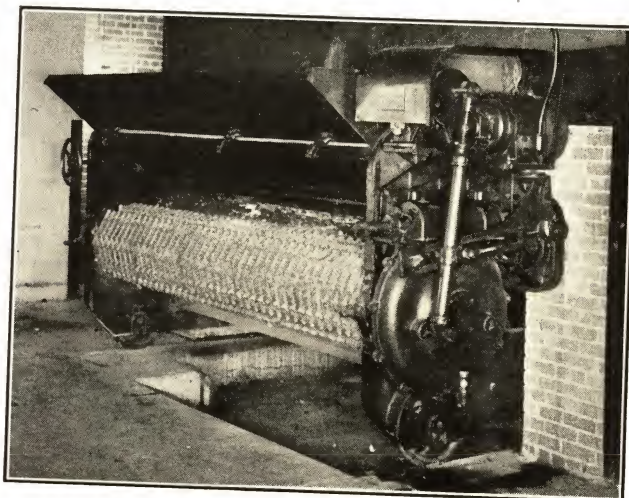
Laclede Forced Draft and Natural Draft Chain Grate Stokers are designed to burn the screenings from low grade coals. Continuous automatic ash disposal removes the ash from the furnace as soon as the combustible matter has been burned out. Coals having a large percentage of low fusion temperature ash do not cause clinker trouble because there is never any accumulation of ash in the furnace.

The stoker structure is a heavy rigidly braced unit with coal feed and air supply adjustable to suit requirements. The heavy construction results in long life for the stoker, with low maintenance.

Forced Draft Stokers are built for boilers from 250 to 1000 rated horsepower and can operate these boilers with or without preheated air, up to 300% rating. Natural Draft Stokers are built for boilers from 150 to 600 rated horsepower and can operate these boilers up to 200% rating.

Each stoker installation must be engineered separately to meet the requirements. Our engineering experience of thirty years will assure you satisfactory operation.

Our foundry can supply castings of grey iron, white iron, or semi-steel, in sizes from one pound to 30,000 pounds.



Installation Natural Draft Stoker



# KINGSBURY MACHINE WORKS, INC.

4326 TACKAWANNA ST., PHILADELPHIA, PA.

*Manufacturers of Kingsbury Thrust and Journal Bearings*

## KINGSBURY THRUST BEARINGS

**Uses:** Kingsbury Thrust Bearings are intended especially for heavy thrusts and medium to high rotational speeds. With proper lubricant they are suitable also for low speeds. They are widely used for hydroelectric generators, carrying loads up to 1,500,000 lbs. or more; on the propeller shafts of naval vessels, ocean liners, yachts, etc.; in deep well and other centrifugal pumps; in dredges, and in many industrial machines.

**Principle** is that of tapering oil films. One thrust element is divided into segments, which are immersed in oil and free to tilt. Rotation of the collar draws oil between the bearing faces, and the films assume a slight taper due to tilting of the segments. Thus the films are continually renewed.

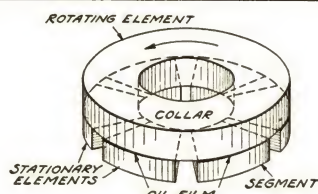
In vertical mountings the bearing cavity is simply filled with oil, which may be air or water cooled according to speed. In standard horizontal mountings the oil level is below the shaft, and the thrust collar is kept flooded by suitable means. Some mountings have built-in coolers. Standard mountings usually have a steady bearing close to the thrust bearing.

In large bearings the thrust shoes are usually separately adjusted. In small bearings they are usually equalizing and self-aligning. Marine bearings are of both types.

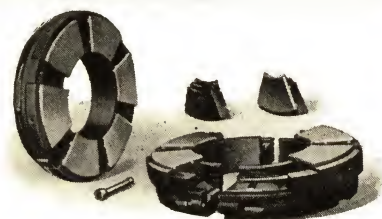
For certain vertical applications where no radial play can be permitted, we have developed the Kingsbury Spherical Bearing shown in one of the illustrations. It combines the thrust and steady bearing functions in a single unit, and is self-aligning with the nearest journal bearing.



Standard Thrust and Journal Bearing for Centrifugal Pumps with Built-in Cooler



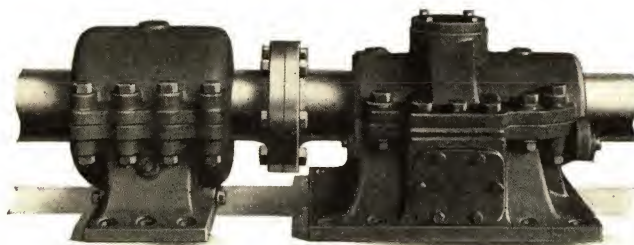
Basic Elements of Kingsbury Thrust Bearing, Showing Tapering Oil Films



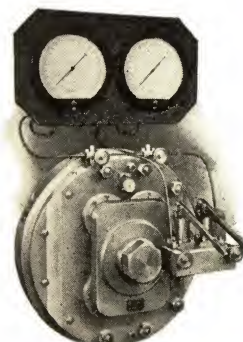
Six-Shoe Split Bearing for Marine and Hydroelectric Use



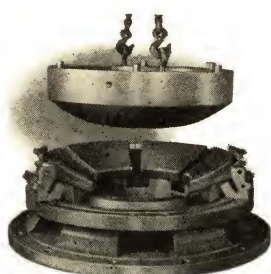
Combined Vertical Thrust and Radial Bearing with Cooling Coil for Oil Bath



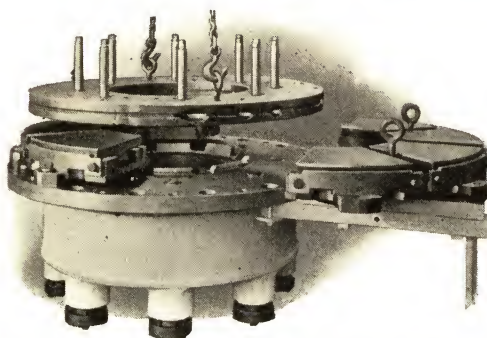
Journal Bearing and Combined Thrust and Journal Bearing, for Marine and Dredge Service



Marine Thrust Meter, Accurately Determines Thrust on Rotating Shafts



Spherical Thrust Bearing, Combining Thrust and Radial Functions



Left: Adjustable Thrust Bearing for Large Hydroelectric Generator

There is no metallic contact when running, and virtually no wear. Coefficient of friction is only from .001 to .005, depending on oil viscosity and load. It diminishes with heavier loads: the capacity increases with higher speeds.

**Standard and Special Mountings:** Standard mountings have been developed for ship propeller shafts, dredge and other centrifugal pumps, and other common horizontal applications; also for deep well pumps, vertical electric motors, etc. We can also furnish special mountings; or the customer may purchase the internal parts and include the mounting in his own design.

## KINGSBURY JOURNAL BEARINGS

For use with Kingsbury Thrust Bearings, we furnish a line of separate horizontal Journal Bearing Mountings. These may be self-oiled, or may receive oil circulated by means within the thrust bearing, or by separate means.

## INQUIRIES

Suitable literature will be sent on request. Inquiries should specify service intended, approximate speed and load; also approximate room temperature, viscosity and temperature of oil if supplied from outside, and temperature of cooling water.



# THE KIRK & BLUM MANUFACTURING CO.

2871 SPRING GROVE AVENUE, CINCINNATI, OHIO

*Specialists in the Design, Manufacture and Installation of Blower Systems and Industrial Ovens  
Plating and Pickling Tanks, Baskets and Acid-Fume Removal Systems  
Contract Manufacturers in All Sheet Metals and Light Structural  
Stainless Steel Fabrication*

DETROIT FACTORY AND OFFICE: 4718 Burlingame Street

CHICAGO OFFICE: 407 S. Dearborn Street

## REPRESENTATIVES

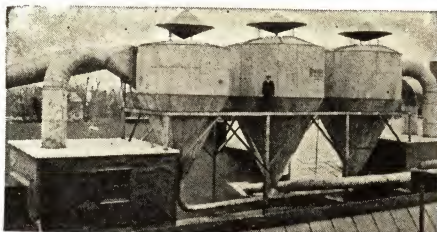
PITTSBURGH, PA. . . Bushnell Machinery Co., 1501 Grant Bldg.

LOUISVILLE, KY. . . Liberty Blow Pipe Co., Inc., 325 Roland St.

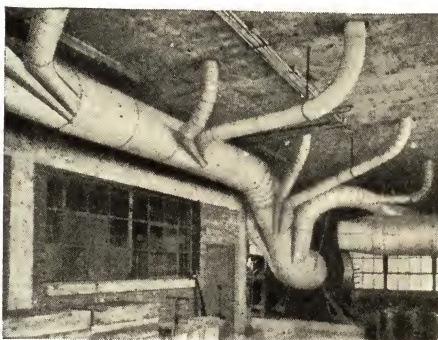
CLEVELAND, Cleveland Duplex Machinery Co., Penton Bldg.

New York . . . . . James H. Leech, 390 Fourth Ave.

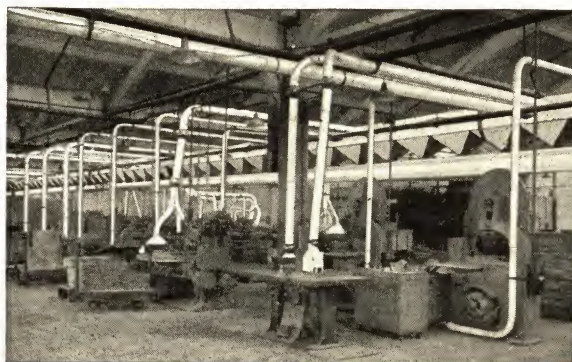
Huntington, W. Va. . . . . Walker & Keeler, P. O. B. 1448



These Giant "Cyclones" Collect All Dust from the Polishing and Buffing Departments of the Maytag Company Plant, Newton, Iowa



K & B Dust Collecting System at Trico Products Corp., Buffalo, N. Y. Note the Streamline Fittings—One of the K & B Exclusive Advantages



Section of K & B Plenum System at Rudolph Wurlitzer Mfg. Co., Tonawanda, N. Y.

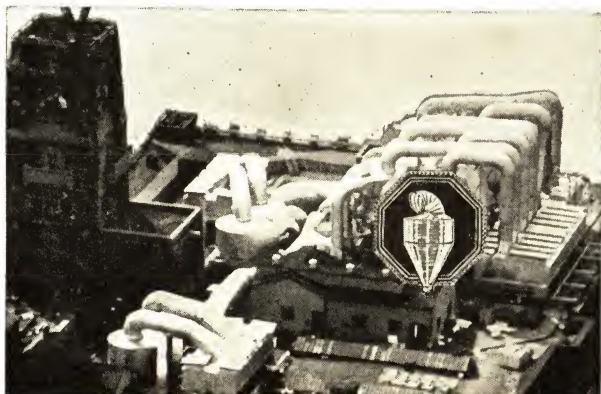


Illustration at Left Shows Dust Collecting Pipes, Cyclone Collectors and Filters—Part of the K & B System at the RCA-Victor Co., Camden, N. J.

## KIRK & BLUM

### PRODUCTS

DUST and SHAVINGS REMOVAL SYSTEMS.  
PAINT SPRAY, FUME and HEAT REMOVAL SYSTEMS.

VENTILATING and AIR CONDITIONING SYSTEMS.  
COOLING, DRYING and HEAT RECLAMATION SYSTEMS for Glass Ceramic Plants.

"CYCLONE" DUST COLLECTORS.  
INDUSTRIAL OVENS for Drying, Baking Enameling and Lacquering.

PICKLING BASKETS, CRATES, LEAD- and RUBBER-LINED TANKS, ACID FUME EXHAUST SYSTEMS.

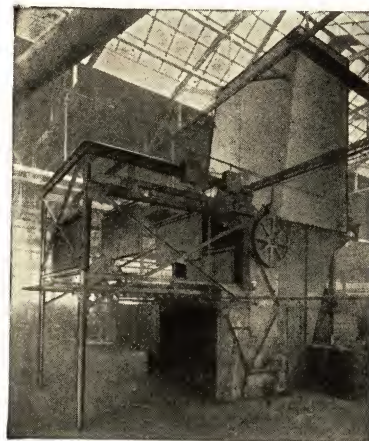
OTHER PRODUCTS: One-piece Elbows; Blast Gates; Pressed and Rolled Steel Flanges; Belt and Machine Guards; Tote Boxes; Steel Tables; all kinds of Metal Stampings, etc.

### ENGINEERING SERVICE

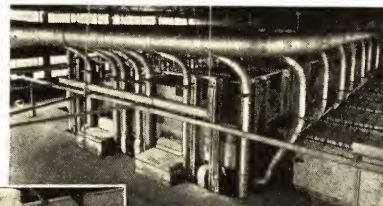
K & B Engineering Service—backed by years of experience in designing and installing K & B Equipment for many of the industrial leaders of the United States, Canada and South America—is at the disposal of architects, contractors, plant engineers and owners.

This service—assuring a definite solution to any problem requiring K & B Equipment—includes: A thorough analysis of the requirements of the job; designing the equipment; submitting a proposal, together with complete specifications and a written performance guarantee; installation by experienced, highly efficient erectors.

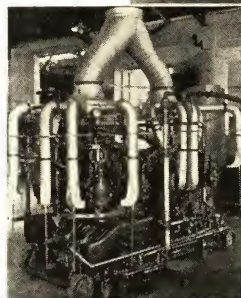
Complete information and valuable data available on request.



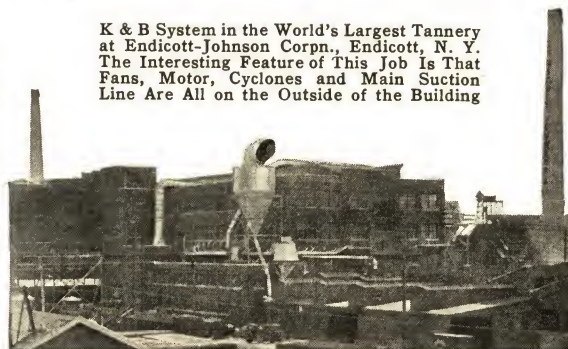
K & B Continuous Conveyor Enameling Oven at the Gemmer Manufacturing Co., Detroit. K & B Ovens—from the Smallest Box Type to Large Conveyor Ovens—Assure Utmost Speed, Economy and Efficiency in Every Finishing Operation



Above:  
K & B Improved Glass Tank Cooling System. Streamline Fittings and Long Radius One-Piece Elbows Assure Greater Air Pressure with Less Power



Left:  
A K & B Scientifically Designed Cooling System on the New No. 10 Lynch Bottle Machine



K & B System in the World's Largest Tannery at Endicott-Johnson Corp., Endicott, N. Y. The Interesting Feature of This Job Is That Fans, Motor, Cyclones and Main Suction Line Are All on the Outside of the Building



# THE KRAISSL COMPANY, INC.

MAIN OFFICE AND FACTORY

HARPER TERMINAL, 622 MAIN ST., HACKENSACK, N. J.

FACTORIES: BROOKLYN, N. Y., YORK, PA.

NEW YORK OFFICE: 23 E. 26th St.

## KRAISSL PUMPS FOR SPECIAL SERVICES

Our mission in business has always been to design and build pumps for specialized quantity applications where the pump becomes an integral part of a machine, system or installation. It has been our experience that no one design will meet all conditions and this has resulted in the development of a variety of displacing mechanisms. When a number of clients adopt the same design we regard this as a standard and issue descriptive literature. Those pumps not listed in our



literature are classified as special pumps. This is one of the most important phases of our business, as sometimes the interval between a special pump becoming a standard is only a few months. We earnestly invite inquiries concerning the designs we have available to meet any particular requirement. Our standard designs include Vacuum Pumps and Compressors; Wet Vacuum Pumps; Rotary Liquid Pumps; Centrifugal Pumps; Fuel Oil Pumps; Turbine Pumps; Strainers.

### CLASS 11, 17, 21 AND 25 SERIES VACUUM PUMPS AND COMPRESSORS:

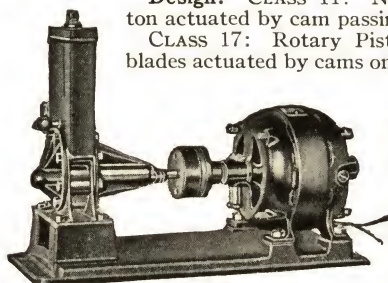
**Description:** Designed for direct connection to motor. Can be furnished tested to vacuums within  $\frac{1}{2}$ " of barometer. Pressures up to 150 pounds when water cooled. Capacities  $\frac{1}{2}$  to 35 cu. ft. free air per minute. Larger sizes being designed.

**Design:** CLASS 11: New Patented Rotary Piston actuated by cam passing over internal rollers.

CLASS 17: Rotary Piston carrying displacement blades actuated by cams on face and end plates.

CLASS 21: Rollers carried in rotary piston actuated by centrifugal force. Friction reducing rolling contact.

CLASS 25: Thin multi-blades carried in rotary piston actuated by centrifugal force—one of the most useful all around designs.



All pumps equipped with automatic lubricating return system complete with reservoir.

**Applications:** General Mechanical Suction and Pressure Service, where compact, non-pulsating, air handling units are desired.

**Advantages:** Quiet operation. Built to stand up under the most severe conditions of continuous service.

### CLASS 70 SERIES ROTARY PUMPS:

**Description:** For services where slow speed pump is desirable. Pressures with standard pumps up to 50 pounds. Special pumps for higher pressures. Wet vacuums up to 27" mercury. Manufactured from alloys and non-metallic substances to meet requirements of corrosive services. Standard pumps form iron or bronze. Capacities 3 to 180 g.p.m. Belt or motor drive.

**Design:** Special reciprocating blade principle actuated by revolution of Rotary Piston. Blades take up own wear over long period and then easily replaced. Bearings special oilless type.

**Applications:** Bilge, forced feed lubrication, wet vacuum service on oil stills, hot oil, transfer viscous materials and hand pumps.

**Advantages:** High volumetric efficiency at slow speeds.

### CLASS 60 FUEL OIL PUMPS:

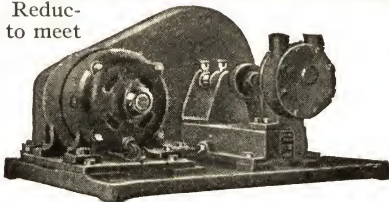
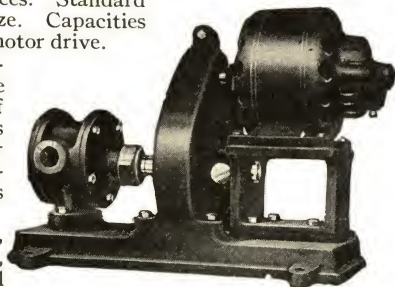
**Description:** For commercial and industrial burners. Direct drive units for light oil. Reduction drive units for heavy oil. Capacities 30 to 3000 g.p.h. Pressure standard pumps up to 100 pounds. High pressure pumps up to 350 pounds.

**Design:** Pump internal gear specially machined to give high suction characteristics. Reduction drive unit developed to meet requirements of this service.

Internal Ball Bearings furnished with High Pressure Pumps.

**Applications:** Oil burners, especially difficult services handling 14-16° Bé. oil. Hydraulic pressure systems employing oil to transmit pressure.

**Advantages:** Absolute quietness. Ball Bearing Transmission. Meets most severe conditions of continuous service. Very high suction lift. Duplex units available on single bed plate.



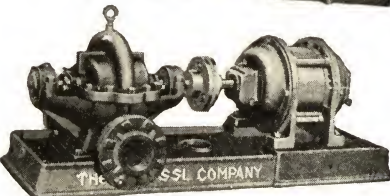
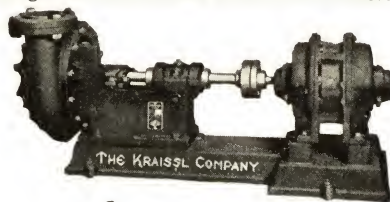
### CLASS 32 CENTRIFUGAL PUMPS:

**Description:** Complete line of open and closed impeller centrifugal pumps for all services where this type of pump can be employed. Capacities 1 to 5500 GPM. Belt or motor drive.

**Design:** Side Suction Type. Particular care has been taken with impeller design so that maximum efficiency is obtained. Attention has been concentrated on the proper bearing for each type of service.

**Applications:** Aside from general service we have concentrated on a number of special units for handling steam return condensate, sewage ejection, sump pump, bilge, air conditioning, and sanitary service.

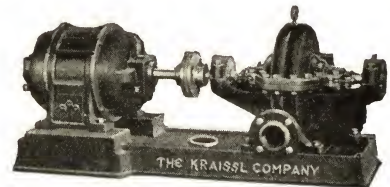
**Advantages:** Very well engineered pumps to meet the demand for a superior product that will last indefinitely under continuous operation. Outboard bearings integral part of pump head.



Class 34 Single-Stage Centrifugal Pump

### CLASS 34-SINGLE-STAGE AND CLASS 36 TWO-STAGE CENTRIFUGAL PUMPS:

**Description:** Ball Bearing Horizontal Split Case Type designed to obtain highest efficiency on both High and Low Head operation. Capacities—single-stage, 90 to 5000 GPM; two-stage, 100 to 675 GPM.



Class 36 Two-Stage Centrifugal Pump

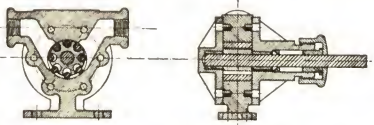
### CLASS 50 SERIES PUMPS:

**Description:** This mechanism has characteristics intermediate between positive displacement and centrifugal designs and possesses most of the advantages of both.

**Design:** Multi-rollers are carried in the recesses of eccentric rotary piston. These emerge due to centrifugal force and follow the inside periphery of the housing causing the displacing action. The action is similar in effect to a large roller bearing and reduces friction to a minimum. Rollers are manufactured from both metallic and non-metallic substances, depending upon service requirements.

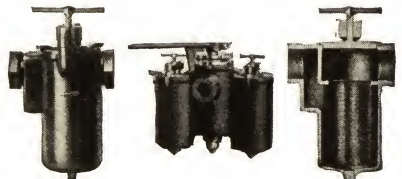
**Advantages:** Handles small capacities against high head pressures with high efficiency. Good suction characteristic.

**Application:** Suited to handling both light and moderately viscous liquids over a wide range of requirements.



### CLASS 72 SINGLE AND DUPLEX STRAINERS:

For pressures up to 150 pounds. Correct mesh screen for each class of service.





# THE LINCOLN ELECTRIC COMPANY

13034 COIT ROAD, CLEVELAND, OHIO

*Largest Manufacturers of Arc Welding Equipment in the World*

ATLANTA, GA.  
BALTIMORE, MD.  
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MONTREAL, QUE.  
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SAN FRANCISCO, CAL.  
SAN JUAN, PORTO RICO  
SAO PAULO, BRAZIL  
SCRANTON, PA.  
SEATTLE, WASH.  
SYRACUSE, N. Y.  
TOKIO, JAPAN  
TOLEDO, OHIO  
TORONTO, ONT.  
TULSA, OKLA.

## PRODUCTS:

Lincoln Welders, manual and automatic; electrodes and other welding accessories; Lincoln "Linc-Weld" Motors, A.C. only in standard types,  $\frac{1}{2}$  to 200 H.P.

## SHIELDED ARC PROCESS OF WELDING:

Welds made by the Lincoln shielded arc process have the following physical characteristics: tensile strength, 65,000 to 85,000 pounds per sq. in.; ductility, 20 to 30% elongation in 2 inches; density, 7.82 to 7.86 grams per cc.; fatigue resistance, 28,000 to 30,000 pounds per sq. in.; impact resistance, 50 to 80 ft. pounds; corrosion resistance greater than mild rolled steel. The most economical production of welds made with a shielded arc requires use of Lincoln "Shield-Arc" Welders and Lincoln "Fleetweld" electrodes for manual welding; for automatic welding, the Lincoln "Electronic Tornado."

## THE LINCOLN "SHIELD-ARC" WELDER:

Lincoln "Shield-Arc" Welders have many exclusive patented features which permit The Lincoln Electric Company to make the following 3-way guarantee of welding with a "Shield-Arc" Welder:

1. More weld deposit per K.W.H.
2. Faster welding per K.W.H.
3. Lower cost per unit of welding—the unit being per lineal foot of weld, or per pound of weld metal, or per hour of welding.



Lincoln "Shield-Arc" Welder

Lincoln "Shield-Arc" Welders, A.C. and D.C. motor driven, are built in the larger sizes so essential for proper welding with shielded arc.

Lincoln Welders are also built in 100 and 200 ampere sizes, A.C. and D.C. motor driven type; also in 100 to 600 ampere sizes, belt and gasoline driven types.

Exclusive with Lincoln Welders is the new "Lincontrol," a unique device requiring no extra cables, portable rheostat or other troublesome accessories, for remote control of welding current.

## WELDING ELECTRODES:

**"Fleetweld":** An extruded rod for manual welding with shielded arc process. Welding speed 150 to 300 per cent faster than ordinary welding.

**"Shield-Arc 85":** For welding high tensile structural steels.

**"Stainweld A":** An extruded rod for welding stainless steel.

**"Aluminweld":** For welding aluminum.

**"Lightweld":** For welding 18 ga. to 24 ga. metal. It is a coated rod used with carbon arc.

**"Stable-Arc":** A non-splashing rod, coated blue, preferred for general welding purposes.

**"Manganweld":** For welding high manganese steel.

**"Wearweld":** For hard surfacing non-austenitic steels.

**"Hardweld":** A high carbon rod for giving hard surface to resist abrasion.

**"Ferroweld":** The electrode that solves cast iron welding problems.

## WELDING ACCESSORIES AND SUPPLIES:

Electrode holders, cables, face and head shields, aprons, gloves, wire brushes and glass of high quality and design to promote the most efficient welding are handled by The Lincoln Electric Company.

## AUTOMATIC ARC WELDERS:

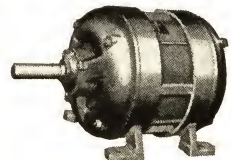
Both the Lincoln Electronic Tornado automatic welding head and the Lincoln automatic feeder of "Fleetweld" electrodes provide a completely shielded arc for automatic welding of all types of work. The automatic welding head may be mounted on special fixtures for specialized production welding jobs. Also built with self-propelled tractor carriage for large pipe and plate work. Complete information sent on request.

## LINCOLN "LINC-WELD" MOTORS:

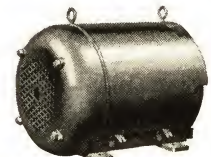
Known as the motors which deliver extra horsepower without sacrifice of power factor or efficiency. Use of arc welded rolled steel in frame construction provides structural strength without bulk. This permits larger openings for greater ventilation, resulting in cooler operation. Built for A.C. current in all standard types of polyphase induction motors. Well adapted for pumps, fans or blowers as well as for general service.

Use of the Stainless Steel Motor, the "Linc-Weld" Type E (totally enclosed, fan cooled) is recommended wherever there is dust, dirt, moisture or fumes in sufficient quantities to clog an open type motor or to abrade or corrode the windings and bearings. Though completely sealed, the "Linc-Weld" Type E Stainless Steel Motor will operate continuously at full load well within the N.E.M.A. allowable temperature rise of 55° C.

Positive protection from overheating is made possible in the new "Linc-Weld" Self-Protecting Motor. When the windings reach the maximum safe operating temperature (90° C.) from any cause, it automatically disconnects itself from the power source. Lincoln automatic controls are furnished with this motor.



The Motor with the Extra Horsepower, Lincoln "Linc-Weld," Type D



The Stainless Steel Motor Lincoln "Linc-Weld," Type E, Totally Enclosed, Fan Cooled



# LINK-BELT COMPANY

300 W. PERSHING RD., CHICAGO

5049

INDIANAPOLIS  
220 S. BELMONT AVE.

PHILADELPHIA  
2045 W. HUNTING PARK AVE.

SAN FRANCISCO  
400 PAUL AVE.

*Manufacturers of Equipment for Handling Materials Mechanically and Transmitting Power Positively*

ATLANTA  
BALTIMORE  
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ST. LOUIS  
ST. PAUL  
WILKES-BARRE

IN CANADA—LINK-BELT LIMITED—TORONTO PLANT; MONTREAL; VANCOUVER

## PRODUCTS

Complete Conveyor, Elevator and Power Transmission Equipment—Chains, Wheels, Pulleys, Buckets, Flights, Troughs, Casings, Take-ups, Hand-wheels, Shafts, Bearings, Collars, Couplings, Hangers, Floor Stands, Gearing, Sheaves, Fly-wheels, Clutches, Bushings, etc.; Bunkers, Bins, Gates, Chutes; all types of Conveyors—Chain, Belt, Face, Pan, Apron or Bucket, Pivoted Bucket, Portable, Retarding, Scraper, Helicoid, Screw, Shuttle, etc.; Belt Conveyor Trippers; All types of steel, Promal or malleable Sprocket Chains; Silent Chain; Silverlink Roller Chain; Herringbone Gear Speed Reducers; Worm Gear Speed Reducers; Motorized Speed Reducers; Herringbone Gears; P. I. V. Gear and V. R. D. variable speed transmissions; Screens—Bar, Grizzly, Lip, Perforated Metal, Revolving, Sewage, Shaking, Vibrating; Feeders—Apron, Conveyor, Grizzly, Reciprocating; Automatic Underfeed Screw Type Stokers, Industrial and Domestic types; Loaders and Unloaders; Cranes—Locomotive, Crawler, Bridge, Gantry, Erecting and Wrecking, with Grab Buckets, Wood Grapples, Shovel-Dragline and Trench Hoe, etc.; Dumpers of various types for Railroad Cars, Mine Cars, Quarry Cars, Skip Cars, etc.; Hoists—Drag Line, Scraperloader, Skip; Excavators—Dragline, Clamshell, Trench, Scraper, Buckets, Dumping Buckets, etc.; Car Hauls, Car Pullers, Car Spotters; Coal and Ore Handling Bridges, Coal Dryers; Sand, Mold, and Casting Handling Equipment.

## ELEVATORS AND CONVEYORS



Link-Belt designs and builds complete in its own plants, conveyors and elevators of all types, as well as a complete line of chains, pulleys, idlers, sprockets, buckets, take-ups, and all accessories for the complete elevator or conveyor installation.



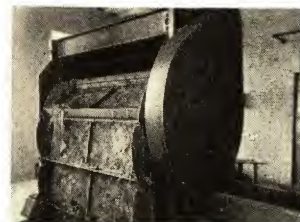
## COAL AND ASHES HANDLING EQUIPMENT



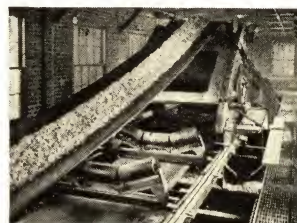
Link-Belt has equipped hundreds of power plants, both small and large, for the efficient and economic handling of coal and ashes. The Link-Belt line includes every type of elevator and conveyor for this service, as well as crushers, bunkers, gates, spouts, weigh laries, feeders, and other equipment.

## "CLEAN WATER" INTAKE SCREENS

Link-Belt "Clean Water" Intake Screens assure effective, economical screening of condenser water under all conditions. Send for *Catalog No. 1252*.



Water Intake Screen



Belt Conveyor

## BELT CONVEYORS

Free-turning, accurately made idlers assure Link-Belt belt conveyors a good road bed for economical operation—minimum friction loads—and lowest maintenance cost. Link-Belt makes a full line of anti-friction, pressure-lubricated idlers, as well as various types of plain bearing, and grease cup idlers. Also a complete line of trippers and other belt conveyor equipment.

## POSITIVE DRIVES

For the positive transmission of power Link-Belt manufactures a line of silent and roller chain drives, herringbone and worm gear speed reducers, and variable speed transmissions of the V. R. D. and P. I. V. types. Send for *Catalogs Nos. 125, Silent Chain Drives; 1457, Roller Chain Drives; 1415, Herringbone Gear Speed Reducers; 1274, P. I. V. Gear and 1374, V. R. D. (variable speed drives)*.



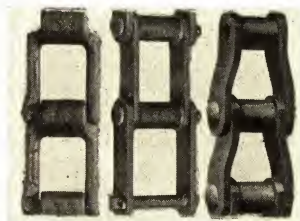
Silent Chain Drive



Roller Chain Drive

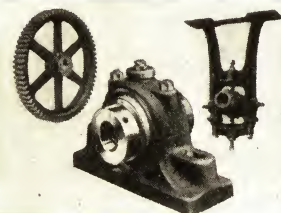
## CONVEYING AND DRIVING CHAINS

For the many average classes of power transmission and conveying service, Link-Belt builds light and heavy duty chains of steel, malleable iron, or Promal (the stronger, longer-wearing metal for cast chains).



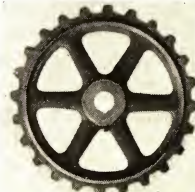
## POWER TRANSMISSION ACCESSORIES

Bearings, gears, pulleys, pillow blocks, clutches, hangers, flexible couplings, safety collars—a complete line. *Catalog 600*.



## SPROCKET WHEELS—FROM STOCK

Cast tooth sprocket wheels in Flint-Rim metal or gray iron, for the popular sizes of chain, are available from large stocks carried at our plants and warehouses throughout the country. Send for Stock Sprocket Wheel List, *No. 1267*.





# J. E. LONERGAN CO.

Established 1872

211-217 RACE STREET, PHILADELPHIA, PA.

Manufacturers of Steam and Gas Engine and Boiler Specialties

## PRODUCTS

POP SAFETY VALVES; RELIEF VALVES; PRESSURE GAUGES; AMMONIA GAUGES; HYDRAULIC GAUGES; WATER GAUGES; CHIME WHISTLES.

Also Plain Whistles and Whistle Valves, Vacuum Gauges, Steam Gauge Syphons, Revolution Counters, Marine and Engine Room Clocks, Lubricators and oiling devices.

Also manufacturers of Sight Feed Oil Cups, Cylinder Sight Feed Lubricators, Multiple Oilers, Cylinder Oil Pumps, Grease Cups and Oil Level Gauges.

### POP SAFETY VALVES

Types "WT" and "WRT": Built in accordance with A.S.M.E. code. Absolute lifting leverage—positive opening—gradual closing—minimum blowdown. Can be disassembled without disconnecting escape pipe—outside adjustment—ball joints at spring steps—body and bonnet gray iron—steel stem—bronze seat and disc—alloy steel spring—guaranteed. Type "WT" is primarily designed for water tube boilers but is suitable for all types of boilers. Sizes 2, 2½, 3, 3½, 4 and 4½ ins. Type "WRT" is for fire or return tubular boilers. Sizes 2, 2½, 3, 3½, 4 and 4½ ins. Pressures up to 300 lbs.



Model "WTES"

Type "WTES": All steel body pop safety valve, exposed spring for use in connection with superheated steam and high pressure, solid nickel alloy seat, disc and ring. Sizes 2, 2½, 3, 3½, 4 and 4½ ins.

Models "KDP" and "ODP": Dust and fool-proof all bronze pop safety valve. A sealed valve that is meddler, dust and fool-proof—conforming to A.S.M.E. code and all state laws in agreement with this. Dust cap, integral part of lift and enclosing adjustments cannot be removed without breaking seal of king bolt. Sizes over 2 in. have compound lifting lever. Stem movement, straight line, pull and thrust.

"ODP," with side outlet, in sizes from ½ to 4 ins.; "KDP," with top outlet, in sizes from ½ to 3 ins.



Model "H"

### RELIEF VALVES

Model "H" "Underwriter" Type Water Relief Valve: Iron body, bronze mounted. Hand wheel regu-

300 specialties  
for power plants

**Lonergan**



Type "WT"



Model "HRV"

lates opening pressure. Good for working pressures up to 300 lbs. Recommended for use on pumps, elevators, pipe lines, water works, etc.

Model "HRV" Hydraulic Relief Valve: Especially designed for pressures from 400 to 10,000 lbs. Outlet connection in base casting so that in regrinding valve seat, outlet piping does not have to be disconnected. Made in brass, iron and cast steel also.

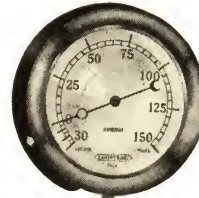
### PRESSURE GAUGES

For steam, water, air or vacuum. Pressure gauges graduated to any pressure not exceeding 1000 lbs. Vacuum gauges graduated to 30 ins.

Type "BOE" Gauge: Will outlast the apparatus to which it is connected. Built in a cast bronze case and flare ring—not spun brass—hence will not dent or distort with rough handling, thereby destroying its accuracy. Made for all fluids or gases; heavy seamless drawn bourdon tube. Graduated to any pressure from 15 to 1000 lbs. Dial sizes from 5 to 12 ins.



Pressure Gauge



Ammonia Gauge



Hydraulic Gauge

### AMMONIA GAUGES

Model "SAG": Graduation 30-in. vacuum and 150 or 300-lb. pressure. Tube of tool steel, threaded and sweated into connections. Movements of monel metal.

### HYDRAULIC GAUGES

Model "GH": Graduations 1000 to 30,000 lbs. Tubes of bar tool steel turned, drilled and formed, threaded and sweated into connections.

Model "GHB": With maximum hand and resetting device.

### WATER GAUGES

Model "QC": Can be closed from safe distance to prevent scalding fireman if glass breaks.

Model "USN": For marine work, automatic ball valve, double safety guard against scalding fireman.

Model "AC": Closes automatically when glass breaks; automatic valve with renewable seat and quick closing thread.

Model "EH": Plain gauge with wood or iron wheels.



Model "QC"

### CHIME WHISTLES

Model "WV": Sizes 8, 10 and 12 ins. are equipped with compound balance valve, as it is very difficult to open an ordinary valve for these large sizes when used on high steam pressure. Bells of solid cast bronze and not built up with a web inside of a lap-welded tube. Flanged connections furnished at an extra charge.

Recommended for marine and stationary work, fire alarms, etc.



# McINTOSH & SEYMOUR CORPORATION

Division of AMERICAN LOCOMOTIVE COMPANY

MAIN OFFICE AND WORKS: AUBURN, N. Y.

*World's Largest Exclusive Manufacturers of Stationary and Marine Diesel Engines*

NEW YORK, N. Y. . . 30 Church St.  
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BOSTON, MASS. . . 88 Broad St.  
TULSA, OKLA. . . Philtower Bldg.

CHICAGO, ILL., McCormick Bldg.  
OMAHA, NEB. . . . Barker Bldg.

WASHINGTON, D. C. . . Barr Bldg.  
SAN FRANCISCO, CAL. . Bourn Bldg.

## McINTOSH & SEYMOUR DIESEL ENGINES

**Experience and Application:** Out of almost 50 years of engine building experience, we have devoted the last 20 years to the design and manufacture of Diesel engines exclusively.

Actual records based on thermal efficiency, reliability of performance and low costs for repairs, attendance and fuel, account for the fact that large numbers of McIntosh & Seymour Diesel engines are chosen to serve practically every power requirement in stationary and marine fields, a few of which follow:

### STATIONARY SERVICE

Central Stations  
Municipal Power and Water  
Pipe Lines, Refineries  
Flour, Cement, Chemical Plants  
Cotton, Textile, Sugar Mills  
Ice and Cold Storage Plants  
Mines and Quarries  
Office Buildings, Hotels, Department Stores  
Stand-by for Hydro-Electric

### MOBILE SERVICE

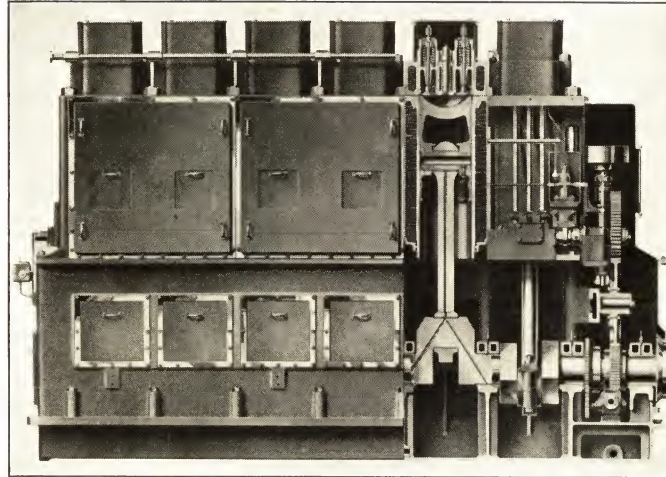
Locomotives, Shovels  
Drag Lines, Rail Cars

### MARINE SERVICE

Motorships  
Diesel Electric Ships  
Inter-Costal Freighters  
Towboats, Barges  
Tugs, Dredges  
Pleasure Craft and various craft for river, harbor and sea-going service.

### PORTABLE SERVICE

Oil Field Pumping Units  
Oil Well Drill Rigs  
Generating Units



Standard 750 B.Hp. Mechanical Injection Diesel Engine.  
Elevation and Section Note Compactness and Simplicity

Fuel Injection System is individual Bosch plunger type pump for each cylinder, actuated from single camshaft but with separate adjustment for each cylinder. Perfected nozzles insure thorough fuel atomization.

Cylinder Heads are special cast iron individually stud bolted to cylinders. Cylinder liners are removable. Free and liberal distribution of cylinder cooling water is insured by design which allows uniform stress distribution and uniform conduct of heat. Rocker arm assembly is easily removable.

Engine Governor is of centrifugal type with rotating weights, geared to crankshaft and link connected to fuel pump so that speed is practically constant regardless of variations in load.

Connecting Rods of forged steel, hollow drilled and boxes are tin base babbitt lined with provision for adjustment. Pistons are cast iron. Piston pins for small sized engines are full floating type.

### ENGINEERING SERVICE AND LITERATURE

Our engineers are prepared to submit definite performance and cost figures on McIntosh & Seymour engines for use under specific conditions. Your inquiry addressed to our nearest office will bring prompt and practical response without obligation on your part.

The various types of McIntosh & Seymour Diesel engines and their application to a particularized service are illustrated and described in bulletins which will be mailed on request.

### CAPACITIES AND PRINCIPAL DIMENSIONS OF McINTOSH & SEYMOUR STANDARD STATIONARY DIESEL ENGINES

B.H.P.	R.P.M.	No. Cyl.	Bore and Stroke, Inches	Length, Ft. In.	Width, Ft. In.	Height, Ft. In.
150	400	3	10 1/4 x 16	12 10	4 6	6 1
225	360	3	12 1/2 x 18	15 8	5 9 1/2	8 1
230	327	3	12 1/2 x 20	15 8	5 9 1/2	9 1
230	300	3	12 1/2 x 22	15 8	5 9 1/2	9 1
250	400	5	10 1/4 x 16	14 6	4 6	6 1
300	400	6	10 1/4 x 16	15 7	4 6	6 1
375	360	5	12 1/2 x 18	19 11	5 9 1/2	8 1
375	327	3	16 x 20	18 10	9 5 1/2	9 5 1/2
375	225	3	17 1/2 x 25	21 3	10 3	11 10
380	327	5	12 1/2 x 20	19 11	5 9 1/2	9 1
380	300	5	12 1/2 x 22	19 11	5 9 1/2	9 1
400	400	8	10 1/4 x 16	18 6	4 6	6 1
450	360	6	12 1/2 x 18	21 7	5 9 1/2	8 1
460	327	6	12 1/2 x 20	21 7	5 9 1/2	9 1
460	300	6	12 1/2 x 22	21 7	5 9 1/2	9 1
600	360	8	12 1/2 x 18	24 5	5 9 1/2	8 1
615	327	8	12 1/2 x 20	24 5	5 9 1/2	9 1
615	300	8	12 1/2 x 22	24 5	5 9 1/2	9 1
625	327	5	16 x 20	25 3	9 5 1/2	9 5 1/2
625	225	5	17 1/2 x 25	27 5	10 3	11 10
750	327	6	16 x 20	28 2	9 5 1/2	9 5 1/2
750	225	6	17 1/2 x 25	28 7	10 3	11 10
1000	327	8	16 x 20	32 5	9 5 1/2	9 5 1/2
1000	257	5	20 x 26	28 6	12 6	12 9
1000	225	8	17 1/2 x 25	35 8	10 3	11 10
1200	257	6	20 x 26	31 0	12 6	12 9
1600	257	8	20 x 26	37 7	12 6	12 9

**Standard Designs and Sizes:** McIntosh and Seymour Diesel engines for stationary use are built in all desirable standard sizes from 45 to 10,000 B. H. P. capacity. Today's developments feature the 4 cycle single acting trunk piston design with Bosch mechanical injection and centralized control. The number of cylinders per engine depends upon the total H. P. output desired.

Standard engines range from 3 to 10 cylinders with 150 to 1600 B. H. P. Engines are designed for slow, medium or high speeds, depending upon service requirements. Speeds are suited to direct-driven generators and centrifugal pumps, geared reciprocating and centrifugal pumps and belt or rope drive. Double Acting Marine Diesels and Cross Head types are also supplied.

**Construction Features:** The totally enclosed design makes possible forced feed lubrication, a quieter, longer lived engine, but all parts readily accessible simply by removal of inspection doors.

Base and Frame of heavy box girder type with crankshaft main bearing seats as part of the main casting.

Crankshaft one piece solid forged steel (in larger engines two piece shaft is used) chemically and physically controlled and inspected from ingot to final alignment, and arranged so that all critical speeds are eliminated from working range.

Camshaft is a single forging, casehardened and ground.



# T. W. MCNEILL ENGINEERING EQUIPMENT CO.

Formerly BOILER ROOM IMPROVEMENT CO.

GENERAL OFFICE  
VAN BUREN AND KARLOV STS., CHICAGO, ILL.

EASTERN OFFICE: 39 Cortlandt St., New York, N. Y.

## THE MCNEILL REMOTE BOILER WATER GAGE

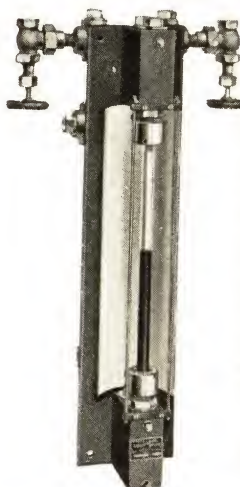
The McNeill Remote Boiler Water Gage shown below is recommended for all high set boilers and where distance or intervening apparatus renders the reading of the regular water column difficult and unreliable.

Note the clear and distinct line of demarcation obtained by the use of the black fluid.

It may be placed anywhere, regardless of height or distance, most convenient of observation by the operator.

No floats, electricity, air or mechanical parts used; action is entirely hydrostatic. May be arranged for wall or panel mounting. Special designs for marine use unaffected by rolling of ship.

Also built for water, oil and acid tanks. Representative installations all over the country, H. I. and Canada. Have record of 7 years' continuous operation without glass breakage or attention of any kind. Full descriptive matter for the asking. Give length of indicating glass (between packing nuts) required and pressure for prices.

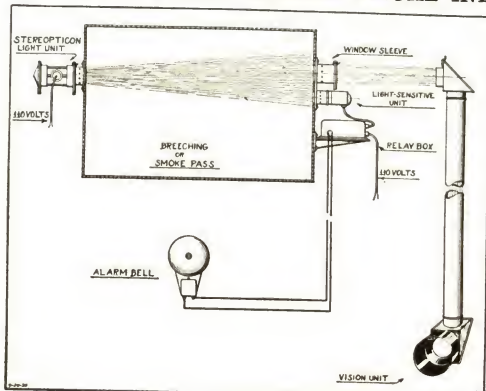


## McNEILL ECLIPSE SMOKE INDICATORS, RECORDERS AND ALARMS

Made in various styles and sizes. The visual type is indispensable in combining smokeless operation with highest possible economy. The visual type may be furnished in combination with photo-electric recorders and alarms or separately as desired.

These indicators are in use by many large central stations throughout the country, by the thousands in the smaller industrial plants, also by the merchant marine, the U. S. Navy and other branches of the U. S. Government. For prices, give type desired, the size of smoke pass and distance from smoke pass to desired location of visual indicator, alarm or recorder.

## COMBINATION OF PHOTO-ELECTRIC ALARM AND VISUAL ECLIPSE SMOKE INDICATOR



This shows typical layout of a combination of visual and photo-electric alarm system. Any type of recorder, indicator or alarm may be added to this system or either may be had separately.

# MAGNETIC MANUFACTURING CO.

614 SOUTH 29TH ST., MILWAUKEE, WIS.

Engineers and Manufacturers of Standard and Special Magnetic Equipment Exclusively

Branch Offices in All Principal Cities—See Telephone Directory

## POWER TRANSMISSION EQUIPMENT

Clutches—"Stearns High Duty" Magnetic Clutches, single and multiple disc type, for minimum and maximum horse power applications, on machine tools, power presses, steel and paper mill rolls, packaging machinery, etc., etc.

Brakes—"Stearns High Duty" Magnetic Brakes, single and multiple disc type, for A.C. and D.C. applications, etc., etc.

## MAGNETIC SEPARATING AND CONCENTRATING EQUIPMENT

Magnetic Separators—Wet and Dry Processes—"Stearns High Duty" Magnetic Separators, standard or induction types for separation or concentration of ores, minerals, sands, foodstuffs, ceramic ware, grain, powder and powdered materials, etc., etc.

Crusher and Pulverizer Protection—"Stearns High Duty" Magnetic Pulleys, Drums, Apron Conveyor and Suspended Magnets for extraction of tramp iron, etc., etc.

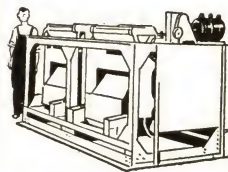
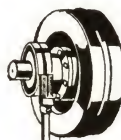
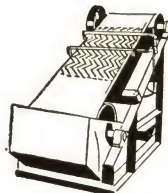
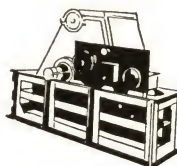
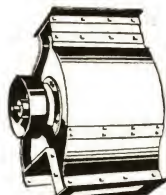
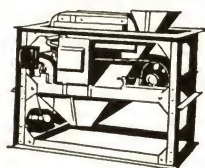
## EXPERT MAGNETIC ENGINEERING SERVICE

Magnetic Applications—Expert attention given to designs of unusual or special nature.

Thirty-five Years' Experience—Your problems, if placed in the hands of Stearns engineers, will be determined on a performance basis, and equipment recommended will maintain its high efficiency and performance throughout its entire life.

## LABORATORY FACILITIES

Send Material for Test—Fifteen (15) different types of separators available for treating materials by both the wet and dry processes. Describe your problem in detail, results you desire, capacity in tons or cubic feet per hour, chemical analysis, kind of electric current available, etc., etc. Include prepaid 25 to 50 lbs. of material properly prepared, quartered and sized for magnetic treatment; sizing from 20 to 80 mesh usually gives best results, if commercially feasible. Also include all helpful data possible, pertinent to your operations, to enable us to handle the problem intelligently. Complete laboratory report and recommendations will be made and separated samples returned for your inspection and analysis.





# McMAHON & CO.

WATER ST. COR. LEDGE ST., WORCESTER, MASS.

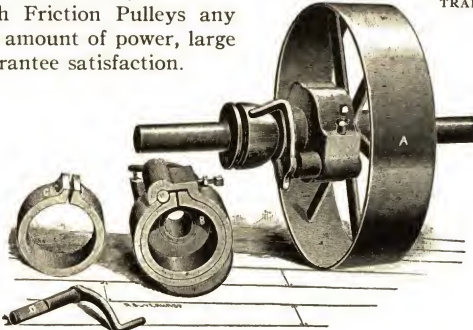
*Manufacturers of Friction Clutches for All Purposes*

## STYLE "A" PATENT FRICTION CLUTCH PULLEY

For Medium and Light Duty.

We can furnish Friction Pulleys any size, to drive any amount of power, large or small, and guarantee satisfaction.

In ordering Friction Pulleys or cut-off couplings, give the number of revolutions, size of shafts and horse-power, as near as possible.



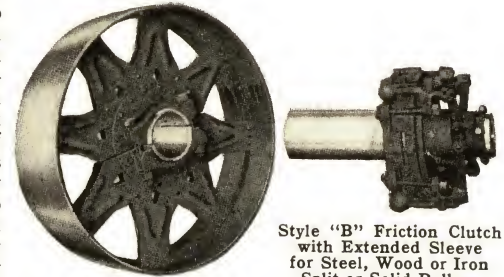
## STYLE "B" PATTERN FRICTION CLUTCHES

For Heavy Duty.

This clutch has been found unusually satisfactory on drives where the work is severe. Its power is

unlimited and operation is perfect; there is no shock or jar on machinery when starting or stopping; it will run satisfactorily at any rate of speed that is practical for any loose pulley to run. When out of clutch they are perfectly free and when

in clutch are as rigid as if keyed to the shaft. Can be thrown in and out of clutch without slacking speed of motive power. Will start heavy loads gradually, while running fast, without injury to the clutch or machinery. All clutches are provided with fric-



Style "B" Friction Clutch with Extended Sleeve for Steel, Wood or Iron Split or Solid Pulleys

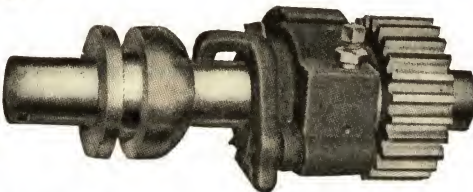


STYLE "A"  
Friction Applied to Bevel Gears

"They Save Power and Belting."

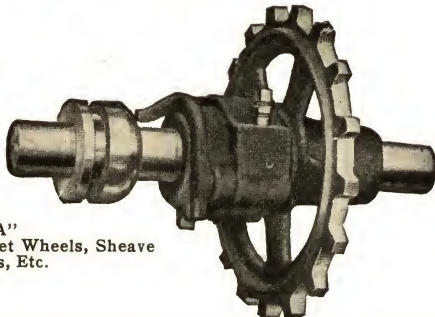
Friction Clutches for all Kinds of Gearing.

STYLE "A"  
Friction Applied to Spur Gears



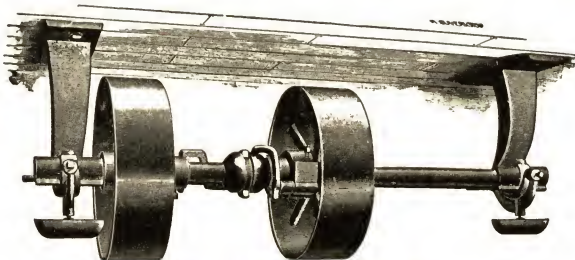
SIMPLE,  
POWERFUL  
AND  
DURABLE

STYLE "A"  
FRICTION CLUTCH COUPLINGS  
For Connecting and Disconnecting Lines of Shafting without Stopping the Power. Simple, Powerful and Durable



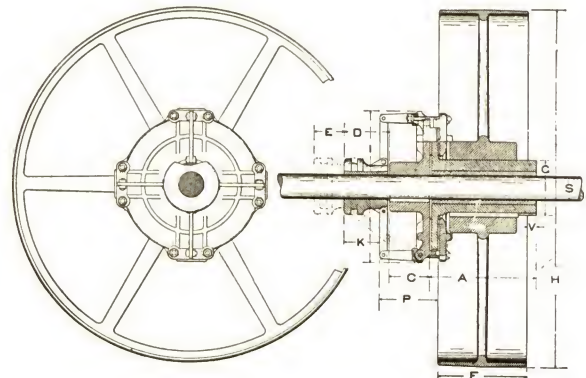
STYLE "A"  
Friction Clutch for Sprocket Wheels, Sheave Wheels, Pulleys, Etc.

We can furnish this Clutch with any sprocket wheel which may be specified, or Clutches only, ready to apply to sprockets, etc.

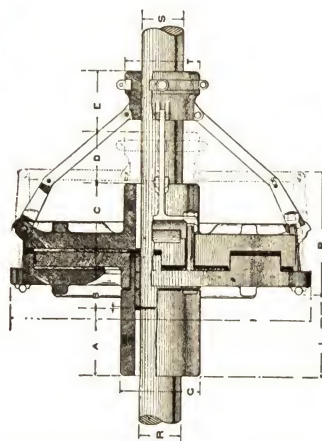


Style "A" Reversing Countershaft

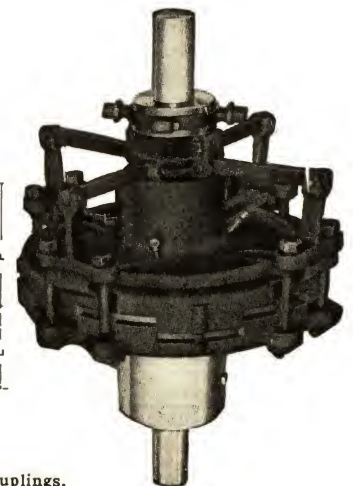
We sell our clutches subject to approval of the buyer, and guarantee them to give entire satisfaction.



tion pads which prevent cutting or wearing of the metal surfaces and make the friction practically indestructible. These Friction Clutches are also furnished for sprocket wheels, rope wheels, and all kinds of gearing.



Style "B" Patent Friction Cut-Off Couplings, Power Unlimited



This Friction Clutch has more driving power, operates easier, will require less repairs and give better satisfaction than any other clutch on the market. The metal surfaces will not cut when starting heavy loads.



## MEARS-KANE-OFELDT, INC.

EXECUTIVE OFFICE AND FACTORY  
1903-1915 E. HAGERT ST., PHILADELPHIA, PA.

*Manufacturers of Automatic Gas-Fired Process Steam Boilers*

### PRODUCTS

#### AUTOMATIC GAS-FIRED PROCESS STEAM BOILERS:

*Kane* fire-tube steel boilers, for process steam.

*Ofeldt* water-tube boilers ("Steam in 4 minutes").

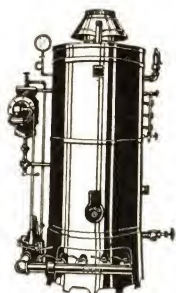
*Kane* cast-iron sectional boilers for low pressure steam, vapor, or hot water heating.

M-K-O AUTOMATIC BOILER FEED PUMP: An automatic feeding and condensation return system.

*M-K-O Atmospheric gas-burners.*

AUTOMATIC CONTROLS, gas and water.

## KANE



Kane Gas Fired Steam Boilers are built in two types. The Standard Kane (Type SA) for general process steam work. The Low Water Line (Type LA) for installations requiring a boiler of special low water level allowing return of condensate to boiler by gravity. Eliminates the use of steam traps, etc.

The vertical steel fire tube internal or boiler proper is built of fire box quality steel. A.S.M.E. specifications. All Types SA and Type LA Kane Boilers are built and approved for 100 lbs. working pressure. Special boilers

and boilers for working pressures in excess of 100 lbs. are built to order. Quotations furnished upon request.

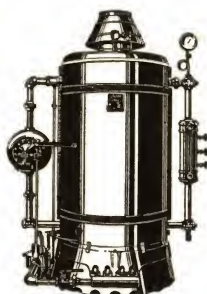


Ofeldt Water-Tube Gas Boiler has an unchallenged reputation for being the fastest steaming process steam boiler, steaming 4 minutes after lighting. This means a big saving in fuel when steam is used intermittently or for short periods. High efficiency is a further characteristic of the Ofeldt. Its compactness saves space and makes it possible to place the boiler near the work, thus eliminating long pipe lines and waste.

Ofeldt boiler construction is approved by A.S.M.E. and the National Board of Pressure Vessel Inspectors.

Standard Style "A" boilers are approved for a working pressure of 100 lbs.

Special boilers or boilers for a working pressure in excess of 100 lbs. are built to order.



### NEW M-K-O AUTOMATIC BOILER FEED PUMP

The new M-K-O Automatic Boiler Feed Pump is designed for economical automatic control of water supply when the steam pressure exceeds city water pressure. It maintains constant water level in the boiler and returns condensation automatically. More Efficient, Rugged and Compact than the former Unit. It is designed for use with KANE and OFELDT Boilers, but may be used with any boiler.

*Send for Literature.*

## MORRIS MACHINE WORKS

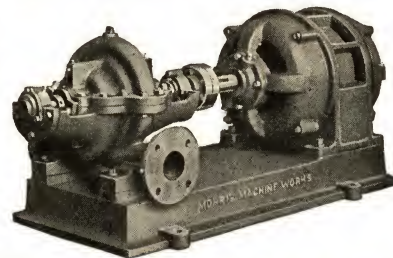
BALDWINVILLE, N. Y.

Established 1864

Representatives in Principal Cities

### DOUBLE SUCTION HORIZONTALLY SPLIT CENTRIFUGAL PUMPS

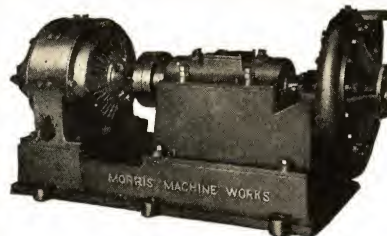
Special design of impellers, casing, sealing rings, bearings, etc., provide exceptionally high efficiency, reliability and durability. Furnished for any capacity and any type of drive at standard speeds, and may be furnished as multiple units for high heads.



Also high-speed units in sizes from 1½ in. to 5 in. for 3500 r.p.m., specially designed throughout to assure perfect balance, complete rigidity and thorough lubrication, as well as high efficiency and low maintenance expense with high-speed operation.

### SIDE SUCTION PUMPS

Designed for a wide range of industrial services where a sturdy, inexpensive pump is desired to handle clear water, chemicals, and moderately abrasive or pulpy mixtures. Heavily built throughout



with open or enclosed impellers, both ring oiling and ball thrust bearing, and will operate successfully on extremely high lift. Furnished in sizes from 1 to 20 in. in both horizontal and vertical types and for any kind of drive.

### NON-CLOGGING SEWAGE AND PULP PUMPS

Horizontal and vertical types for sewage plants, paper and pulp mills, chemical plants, and similar services. Designs assure handling heavy pulp without choking or separation, and permit ready inspection and cleaning of pump.

### SLURRY AND SLUDGE PUMPS

All parts specially designed to handle fine and highly abrasive solids with maintenance of high initial efficiency and low upkeep expense. Liquid passages are large with easy curves, special wear-resisting metals are used for casing, impeller, shaft sleeves, etc., and parts subject to greatest wear are easily and economically renewed.

### SAND AND DREDGING PUMPS AND HYDRAULIC DREDGES

Large range of designs for various kinds, sizes and amounts of abrasive materials, including sand, gravel and larger solids. Each type is specially designed for its particular service and their many distinctive features are based on over 70 years of experience in building centrifugal pumps for abrasive mixtures. Impellers, casings and casing liners are of specially developed alloys where required by the service.

Also hydraulic dredges for sand and gravel production, municipal improvements, and industrial services.

### SPECIAL SERVICE PUMPS

Designs for high head services such as boiler feed, fire protection, mine drainage, etc., for contractors service, for special plant services, for unwatering, irrigation, municipal water supply, condenser circulation, etc. Also screw pumps and sump pumps.

### VERTICAL STEAM ENGINES

Single or double-cylinders, compound and triple expansion, reversing and non-reversing. Sizes from 3 hp. to 1000 hp. for driving pumps, fans, blowers, generating sets, etc.

*Bulletins will be sent gladly on request.*



# THE MEDART COMPANY

Founders and Machinists

3504 DEKALB STREET, ST. LOUIS, MO.

ENGINEERING SALES OFFICES

CINCINNATI  
NEW ORLEANS

CLEVELAND  
SAN FRANCISCO

NEW YORK  
DENVER

PHILADELPHIA  
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CHICAGO  
MILWAUKEE

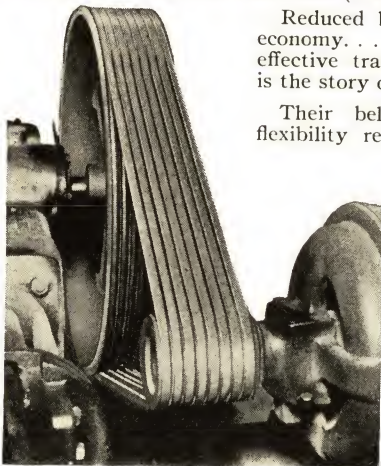
PITTSBURGH

*Manufacturers of Everything in Power Transmission and Special Equipment*

## PRODUCTS:

**Shafting:** Turned and Polished Steel Shafting.  
**Castings:** Iron, Semi-Steel, and Special Medart Alloys.  
**Couplings:** Flange, Keyless, Clamp, Dental Flexible.  
**Collars:** Solid and Split.  
**Hangers:** Collar, Ring, Wick, Plain Oiling—Cast Iron type 4-Point Frames. Timken-Equipped Units.  
**Bearings and Supports:** Flat Boxes, Pillow Blocks, Base Plates, Floor Stands. Timken-Equipped Units.  
**Pulleys:** "Hercules" Steel, Cast Iron, Steel Rim, Iron Center Wood Rim, Split Wood.  
**Rope Drives:** Sheaves and Full Appurtenances.  
**Hoisting Sheaves:** Steel Lined, Bicycle Type.  
**Gearing:** Steel, Iron—In molded or cut types—Mortise Gears.  
**Friction Clutches:** Straight Ring, Slide Block, V-Groove types.  
**Machinery:** Continuous Automatic Bar and Tube Straightening and Polishing Machinery.  
**V-Rope Drive:** Licensed under Patent 1,662,511. V-Sheaves and V-Belts.  
**Miscellaneous:** Belt Tighteners, Mule Stands, Take-Ups, Conveyor Pulleys and Apparatus.

## MEDART V-ROPE DRIVE: (Patent 1,662,511)



V-Rope Drive, Pat. 1,662,511

Reduced belt expense. . . . Greater economy. . . . Longer life. . . . More effective transmission of power—this is the story of Medart V-Rope Drives.

Their belt tension and extreme flexibility result in a more uniform drive—and positive speeds. No vibration—both driving and driven machines run more smoothly . . . especially adaptable to extremely short centers. . . . Sheaves furnished with any number of grooves—all pitch diameters.

Special Engineering Service is available.

## MEDART TIMKEN UNITS:

Units are available in four (4) types of construction: the "SS" Series for general purpose application, the "TS" Series for higher speeds and shock loads, the "DM" Series for conveyor and machinery application, and the "DC" Series for light duty application, and are made in a great many housing designs to meet your requirements.

We build and engineer special mountings for equipment manufacturers and various industries requiring other than standard units.



Timken-Equipped Pillow Block



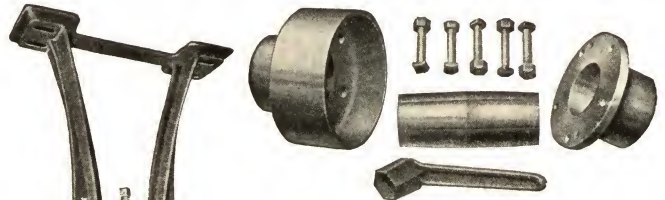
Mitre Gears—  
Cast Teeth or Cut Teeth

## GEARS:

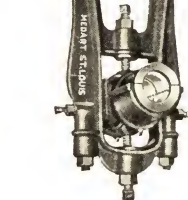
Every type for every purpose—spur, bevel, mitre, angle or worm. Either machine molded, pattern molded, or cut tooth. Large stocks, complete line of patterns and enormous facilities assure fast shipments.

## COUPLINGS:

Accurately machined and substantially constructed. Made in large range of sizes for light and heavy duty, for all types of service.



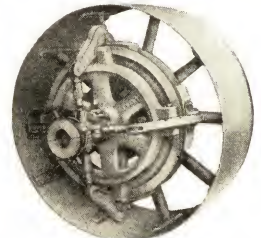
Tapered Sleeve Keyless Coupling



Standard Ring  
Oiling Hanger

## HANGERS:

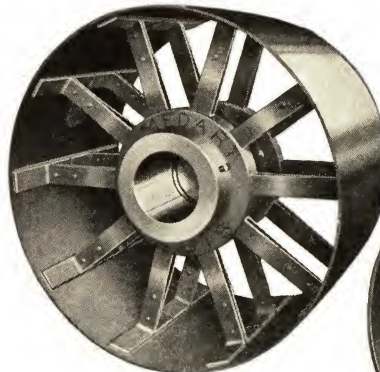
Made in standard, universal, single brace drop, sling post and bracket styles to meet any condition and every type of shaft bearing installation. Can be equipped with Timken Anti-friction Bearings or any type bab-bitted bearings.



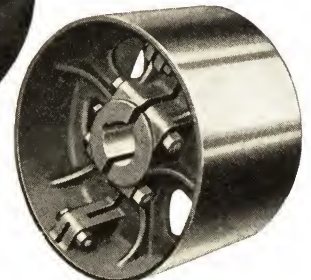
V-Groove Friction Clutch  
with Steel Rim Pulley

## FRICITION CLUTCHES:

V-Groove Friction Clutches. Also cut-off couplings and kindred equipment in a variety of styles and sizes.



"Hercules"  
Steel Heavy Duty Pulley



Heavy Duty  
Cast Iron Pulley

## PULLEYS:

Medart "Hercules" pulleys incorporate steel spokes and steel rims as an integral part to meet conditions of high peripheral speeds, high torques and extremely rugged service in straight, crown or tapered face. In addition we make cast iron, iron center wood rim, split wood. Also special pulleys to meet your requirements.

## MEDART COMPLETE ENGINEERING SERVICE:

Medart's complete staff of Engineers is at your service. They will be glad to make recommendations to show how you can save time and money in your plant by installing V-Rope Drives, Timken Anti-friction Units and Group Drive Equipment. Send us your power equipment layout and specifications, and we will be glad to make a case study of your problem and show, if possible, a savings in capital investment, operation and maintenance costs. No cost or obligation for this service.

## CATALOG:

Send for *Catalog No. 43* and discount sheet for everything in Line Shafting Equipment or for Special Bulletins on Medart V-Rope Drives, Timken Anti-friction Units and Bar and Tube Straightening, Polishing and Turning Machinery.



# MONARCH MANUFACTURING WORKS, INC.

WESTMORELAND AND SALMON STREETS,  
PHILADELPHIA, PA.

## PRODUCTS:

Spray Nozzles, Strainers, Plugs and Seats, Oil Burner Accessories, Humidifier Nozzles, Steam Jets, Quenching Nozzles, Pressure Regulating Valve.

## STONEWARE SPRAY NOZZLES:

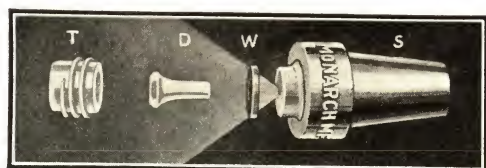


Fig. 6040

Positively uniform capacity and fineness of spray; parts subject to wear (Tip T. and Disc D.) are made of stoneware; are in use in nearly every sulphuric acid plant using water sprays—the best indication of their superiority. *Send for Bulletin 6-C.*

NO. 1 SIZE, FIGS. 6040 AND 6020

Orifice M/M	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/4
Lbs. pressure	Capacity in gallons per hour							
60	1.5	3.3	4 1/4	9.4	11.8	14.0	18.0	22.5

NO. 2 SIZE, FLANGED, FIG. 6020 STONEWARE NOZZLE

Orifice M/M	2	3	3 1/2	4	5	5 1/2	6.3	7
Lbs. pressure	Capacity in gallons per hour							
60	17.5	28.0	38.5	41.7	46.0	55.0	69.0	75.0

## HARD RUBBER SPRAY NOZZLES:



Fig. 621-A

For certain acids hard rubber is very desirable. Tip of nozzle may be renewed or interchanged, thus reducing repair costs. *Bulletin 6-C* gives full capacity data.

CAPACITY  
GALLONS PER HOUR AT 60 LBS.

Pipe	Orifice	1/2	3/4	1	1 1/4	1 1/2
1/2" Pipe	Cap.	2.5	4	7	9	16
3/4" Pipe	Orifice	1	1 1/4	1 1/2	2 1/2	3
	Cap.	6.8	7.2	16	30	50
1 1/2" Pipe	Orifice	2 3/4	3 1/2	5	6.3	
	Cap.	75	90	135	200	

## STRAINER:

This is a special brass strainer suitable for use with our small atomizing sprays. It is made in sizes 1/2, 3/4, 1, 1 1/2, 2, 2 1/2 and 3" and is equipped with copper gauge.

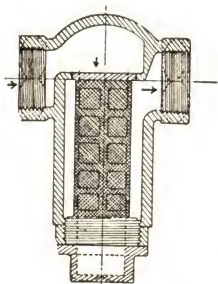


Fig. 900

## OIL STRAINER:

For oil we furnish a special 3/8" Iron body strainer of larger area fitted with monel gauge.

*See Catalog 6-C.*

## AIR WASHER NON-CLOG SPRAY NOZZLE:

Any impurities small enough to pass orifice of this nozzle will never clog back (or leading) hole.



Fig. 629

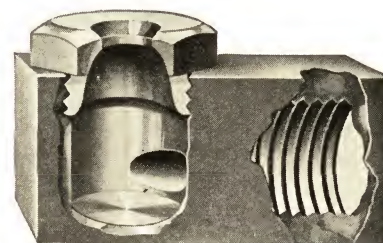


Fig. 631

For industrial air washers, the 1/4", Fig. 631, and 3/8", Fig. 629, are mostly used, delivering 68 gph. at 20 lbs.; orifice and lead holes 3/16" x 5/32". Fig. 631 made all pipe sizes 1/4" to 1", various capacities 4.3 to 1675 gph. at 30 lbs. pressure. Made of brass, steel, monel, stainless steel, KA2MS, etc.

## BRASS SPRAY NOZZLE:

This Fig. 642 nozzle is made of cast brass, and gives long wear; is acid resisting when made of Everdur. Made in all pipe sizes 1/4" to 1". Capacities from 20 to 1280 gph. at 25 lbs. pressure.



Fig. 645

## RE-COOLING SPRAY NOZZLE:

This nozzle is used for recooling condensing water, etc. Made in 1, 1 1/2, and 2" pipe sizes, delivering 9, 15, 27, 40 and 47 gpm. at 10 lbs. pressure.



Fig. B-8

SPRAYS FOR WATER  
Capacity in Gallons Per Hour

Nozzle No.	Lbs. Operating Pressure				
	25	40	60	80	100
1.35		.57	.69	.83	.92
1.65		.75	.89	.99	1.12
2.00		.94	1.14	1.28	1.40
2.50		1.13	1.45	1.64	1.86
3.00	1.03	1.39	1.62	1.85	1.95
3.50	1.36	1.77	2.11	2.46	2.80
4.00	1.56	2.00	2.42	2.77	3.16
4.50	1.86	2.32	2.77	3.21	3.68
5.00	2.20	2.88	3.57	4.09	4.59
5.50	2.22	2.96	3.75	4.31	4.78
6.00	2.55	3.35	4.01	4.78	5.23
7.00	2.90	3.91	4.60	5.17	6.00
7.60	3.16	4.09	5.00	5.62	6.43
8.20	3.57	4.67	5.62	6.42	7.03
9.50	3.81	4.89	6.20	7.03	7.89
10.50	4.10	5.42	7.25	8.33	9.00
12.00	4.75	6.17	7.50	8.65	9.60
13.70	6.34	8.00	9.60	10.70	12.17
15.30	6.81	8.65	10.70	12.17	13.63
17.15	7.25	9.60	11.80	13.23	14.51
19.50	10.00	12.40	15.00	17.30	18.17
21.50	10.46	13.23	16.07	18.00	20.40
24.00	11.84	15.00	17.73	20.40	23.18
30.75	15.00	18.17	22.50	25.00	30.00



Fig. F-27

This F-27 series nozzle breaks water up into the finest spray possible with direct pressure—no air or steam as the atomizing medium. Furnished with stainless steel tip and disc, and brass body having 1/8" or 1/4" pipe tap. Corrosion resisting. Not recommended for anything more viscous than water, unless specially tested; if for oil state viscosity. *See Catalog 6-C.*



# MOORE STEAM TURBINE CORPORATION

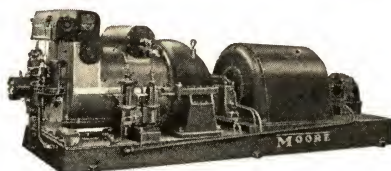
MAIN OFFICE AND WORKS  
WELLSVILLE, N. Y.

*Manufacturers of Steam Turbines and Reduction Gears*

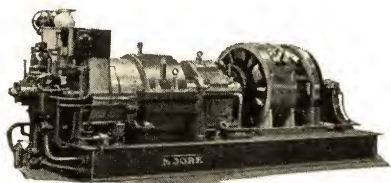
Offices in All Principal Cities

## TURBO GENERATOR UNITS

Moore turbo generator units are built in sizes up to 2500 KW and are available in all types, such as straight condensing, straight non-condensing, bleeder, mixed pressure, mixed pressure bleeder, low pressure, and high back pressure.

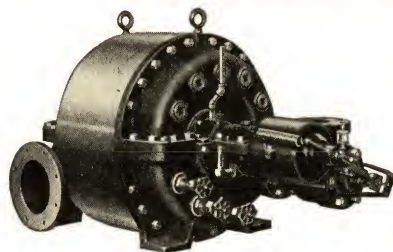


1000 KW Direct Connected  
Turbo Alternator Unit

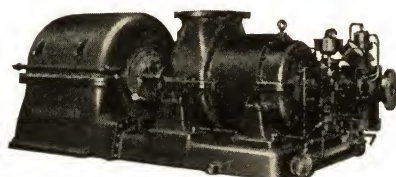


Geared Turbo Generator with  
Automatic Nozzle Control

## MULTISTAGE TURBINES



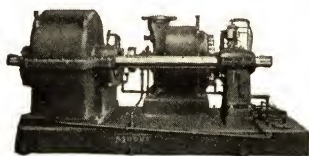
Moore Multistage Steam Turbine



Moore Multistage Turbine Driving Gas Booster

## REDUCING AND INCREASING GEARS

Moore double helical gears are designed with low tooth pressure, have no end thrust and are automatically lubricated both at the bearings and at the line of tooth contact. Each gear is complete with oil pump, oil reservoir and oil cooler. Gear case and bearings are horizontally split. Gear and pinion are rigidly supported insuring correct alignment at all times.



Moore 600 H.P. Geared  
Paper Machine Drive Unit

# MOORE

TRADE-MARK

Each unit is designed to best suit the conditions under which it will operate.

Both direct connected and geared A.C. and D.C. units are available.

Automatic nozzle control is always supplied on large units and is available on the smaller turbines where good economy is desired under varying loads.

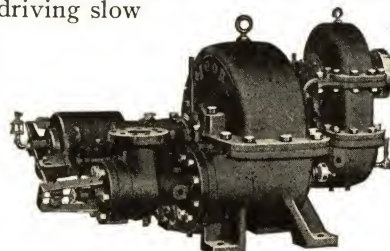
Moore multistage turbines are built in sizes from 25 to 3000 HP. They give better economy and longer blade life than single stage turbines, especially at moderate or low speeds.

These turbines are also built in all types and can be used for any turbine duty where an economical and reliable unit is desired.

## COMBINED TURBINE AND GEAR

Moore combined turbine and reduction gear units are built in sizes from 5 to 100 HP. This arrangement permits economical turbine operation when driving slow

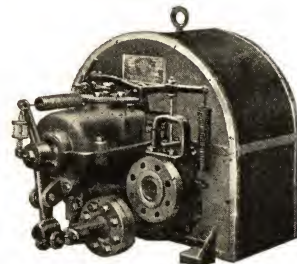
speed machines and is a compact, sturdy, reliable unit. This type unit is especially suited for driving moderate speed auxiliaries where low steam consumption is necessary.



Moore Combined Turbine  
and Reduction Gear

## SINGLE STAGE TURBINES

Moore single stage steam turbines are built in sizes up to 1500 HP. They are especially adapted for driving boiler feed pumps, forced and induced draft fans, coal pulverizers, and other auxiliaries where simplicity of construction and reliability are of prime importance.

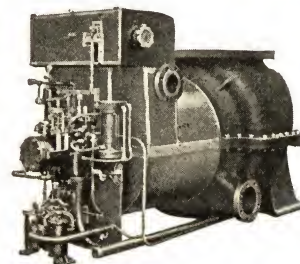


Moore Single Stage  
Steam Turbine

## VARIABLE SPEED GOVERNORS

Variable speed hydraulic governors can be supplied by means of which the speed of the turbine can be varied over a wide range while the turbine is in operation. These governors can be set at any desired speed over a broad range. They can be arranged for remote control.

Emergency overspeed governors are supplied on all Moore turbines as standard construction.

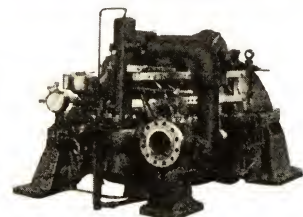


Moore 2500 H.P. Variable Speed  
Turbine for Dredge Pump Drive

## SPECIAL APPLICATIONS

We build steam turbines to meet unusual operating conditions involving special governing requirements. Also turbines for economical operation under varying loads and steam conditions.

Existing inefficient or obsolete turbines no longer suitable for conditions under which they operate, may be readily replaced by modern Moore turbines at reasonable cost.



Moore 1400 Horsepower Double  
Bleeder Mixed Pressure Turbine  
with 5 Distinct Governors

Mechanical Catalog (1934-35)



## A. B. MURRAY CO., INC.

Established 1845

153 WOLCOTT ST., BROOKLYN, N. Y.

*Boiler Tubes and Boiler Fittings*

### BOILER TUBES

All sizes, gauges and types carried in our warehouse stock for immediate shipment including "Shelby" Seamless Steel, Genuine Knobbed Charcoal Iron and Lapwelded Steel Boiler Tubes.

### BOILER FITTINGS

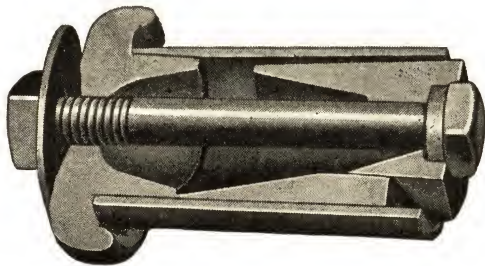
Marine, Flange, Tank and Firebox Steel Boiler Plates  
Flanged Only and Flanged and Dished Heads  
Steel Bars—Steel Angles—Steel Sheets—Structural Steel Shapes  
Diamond and Ribbed Floor Plates for boiler and engine room floors  
Manhole Covers and Saddles  
Handhole Covers  
Boiler Tube Expanders  
Hollow and Solid Staybolts  
Fusible Plugs  
Boiler Tube Plugs  
Boiler Tube Cleaners  
Seamless Copper Ferrules

### "88" SAFETY TUBE PLUGS

For Fire Tubes and Condenser Tubes  
(Not suitable for Water Tube Boilers)

These tube plugs are simple in construction, effective in operation, and are easily and quickly installed.

The plug consists of three cast-iron units, a bolt, nut, gasket and leather washer. The two round, tapered or wedge-shaped, castings are so arranged that when properly placed in the tube and the bolt drawn up the castings expand in the tube holding the cast-iron cap in a fixed and secure position against the tube-end. The greater the pressure behind them the tighter they become. *They cannot blow out.*



The cast-iron cap or plug head is fitted with an asbestos-graphite gasket which will withstand any amount of heat. The washer under the bolt-head is made of leather and, being submerged in either water or steam, will last indefinitely. Under the nut on the bolt is placed an asbestos-graphite washer. When the plug is screwed up tight this washer will prevent leakage, under pressure, from the inside.

While these plugs are designed for emergency purposes they have been used in boilers for many weeks before requiring a new gasket or bolt. They are usually used for split or pitted tubes but, with heavier gaskets placed around the tube-end, will hold up leakage on loose-end tubes.

Through rods holding tube plugs seldom make a tight job because of unequal expansion of the rod and, in most cases, are hard to install due to lack of freeway.

## MURRAY IRON WORKS COMPANY

65th Year of Continuous Operation

BURLINGTON, IOWA, U. S. A.

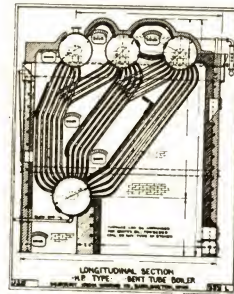
*Builders of All Classes of Steam Power Plant Equipment*

### MURRAY WATER-TUBE BOILERS:

Murray Water-Tube Boilers are built in a number of different styles including the bent-tube type and the longitudinal drum type with inclined tubes and box headers, as well as cross-drum designs. They are built in sizes up to 1000 hp. for pressures up to 400 lbs. and pass the inspection rules of all states and those of the A.S.M.E. They are well designed and carefully made and have fine records for efficiency and durability. Long experience in boiler design and construction, expert mechanics, and thorough supervision are an assurance to the purchaser of a workmanlike and durable job in every installation.



Longitudinal Drum "Type A"



Bent Tube Type

### MURRAY FIRE-TUBE BOILERS:

Horizontal return tubular boilers and Duplex internally fired boilers are furnished where required in connection with smaller plants.

### UNI-FLOW AND CORLISS ENGINES:

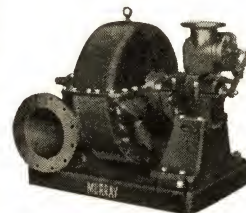
Uni-Flow and Corliss Engines are built in all sizes up to 2000 hp. These engines are generally furnished non-condensing and directly connected to A.C. or D.C. generators and serve excellently in plants where steam economy is of vital importance.

### MURRAY TURBINES:

Murray Turbines are built in sizes from the smallest up to 3000 k.w. and are especially adaptable where high economy combined with minimum supervision is required of a power unit. They are entirely automatic in their operation, having self-contained oiling system with forced lubrication to all bearings. They can be furnished non-condensing or condensing and can also be supplied as extraction units where process steam is needed for any purpose, such as district heating systems for downtown buildings.

For large capacity pumping units, the Murray geared centrifugal units are unexcelled in duty and mechanical performance.

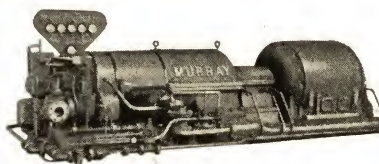
The MURRAY IRON WORKS COMPANY also builds small non-condensing turbines for auxiliary sets, such as boiler feed and circulating pumps, forced and induced draft fans, etc.



Small Mechanical Drive Turbine



Above  
Geared Generator Unit



At Left  
Directly Connected Unit of  
Extraction Type



# NASH ENGINEERING COMPANY

201 WILSON ROAD, SOUTH NORWALK, CONN.

Sales and Service Offices in most of the Principal Cities in the United States and Canada, and Abroad in LONDON, OSLO, AMSTERDAM, BRUSSELS, STOCKHOLM, SYDNEY, and TOKYO

## PRODUCTS:

Return line and air line VACUUM STEAM HEATING PUMPS; CONDENSATION PUMPS; CENTRIFUGAL PUMPS, Standard and Suction; COMPRESSORS and VACUUM PUMPS for air and gases; SEWAGE EJECTORS; SEWAGE PUMPS; SUMP PUMPS.

### RETURN LINE VACUUM STEAM HEATING PUMP:

Removes air and condensation from return lines of vacuum steam heating systems, discharges the air to the atmosphere, and returns the water to the boiler.

Pump consists of two independent units combined in a single casing—an air unit and a water unit. Impellers of both units are mounted on the same shaft, supported on annular ball bearings outside the casing. Pump is bronze fitted.

Air unit exhausts air and vapors and delivers these to the atmosphere without back pressure. Water unit removes the condensation and pumps it directly into the boiler. By handling the air independently of the water, power is saved.

Supplied either direct-connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous operation, or with automatic control.

Furnished in standard sizes with capacities ranging from 4 to 400 g.p.m. of water and 3 to 171 cu. ft. per minute of air. For serving up to 300,000 sq. ft. of equivalent direct radiation.

### THE JENNINGS VAPOR TURBINE VACUUM HEATING PUMP:

The Jennings Vapor Turbine Heating Pump is a new product of the Nash Engineering Company, and combines all of the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current.

This outfit is equipped with a complete electrically operated stand-by unit that will automatically operate should the turbine be cut out for inspection or servicing.

The Vapor Turbine Heating Pump is furnished in standard sizes with capacities ranging from ten to thirty gallons per minute of water, and three to ten cubic feet per minute of air. For services up to 30,000 square feet equivalent direct radiation. Larger sizes built special.

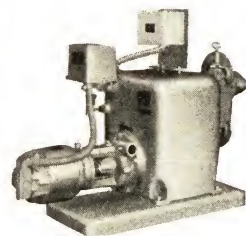


### CONDENSATION PUMP:

Removes the condensation from radiators in return line steam heating systems, particularly radiators set below the boiler water line level and pumps the condensation back to the boiler.

By making the pump casing a part of the return tank, and bolting the motor base to the tank, floor space is conserved. The rectangular construction permits installation in a corner against the wall.

Supplied in standard sizes with capacities ranging from 4 to 200 g.p.m. of water. For serving up to 150,000 sq. ft. of equivalent direct radiation.



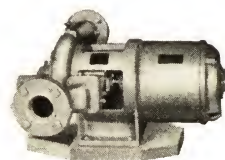
Jennings  
Condensation Pump

### STANDARD CENTRIFUGAL PUMP:

For all centrifugal pump services.

Compact—motor armature and pump impeller are mounted on the same shaft. Simplified—no bearings in pump casing, only one stuffing box. Accessible—pump impeller can be removed without breaking pipe connections, touching packing, or disturbing shaft alignment.

Sizes 1, 1¼, 1½, 2, 3, 4 and 6 in. Capacities to 1900 g.p.m., heads to 300 ft. Bronze fitted standard construction; also all-bronze or all-iron for special services.



Jennings Motor-Driven  
Standard Centrifugal  
Pump

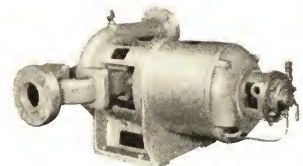
### CENTRIFUGAL PUMP OPERATING WITH SUCTION LIFT:

When the Jennings Suction Centrifugal is started, the built-in Nash Hytor Vacuum Pump exhausts the air from the casing and suction piping. Water is quickly drawn into the pump. Full rated capacity is delivered without delay.

Successful performance is assured under conditions where water level is likely to fall, or where air or gas is handled together with the water being pumped. Intermittent operation is possible without a foot valve.

Furnished in standard sizes with capacities up to 1900 g.p.m. Heads up to 300 ft.

Supplied either bronze fitted or all-bronze construction.



Jennings Motor-Driven  
Suction (Self-Priming)  
Centrifugal Pump

### COMPRESSORS AND VACUUM PUMPS FOR AIR AND GASES:

Operation is as follows: The rotor, consisting of a cylindrical hub, around the periphery of which are

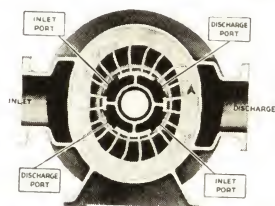


# NASH ENGINEERING COMPANY

chambers or spaces formed by heavy shrouds cast integrally, revolves freely in an elliptical casing or housing filled with water.

As the rotor turns, it carries the water around with it. The water, under the influence of centrifugal force, is compelled to follow the contour of the casing, and alternately to enter and to leave the rotor chambers, twice in each revolution.

As the water recedes from the rotor, air is drawn through the cone inlet port and then through the ports in bottom of rotor chambers into the rotor. As the water is subsequently forced back into the rotor by the converging casing, the air is compressed and then discharged through the ports in bottom of rotor chambers, then through cone outlet ports and finally out through pump discharge.



New Conical Type Nash Hytor Compressor or Vacuum Pump Showing the Unique Principle of Operation

Regularly supplied for pressures up to 45 lb.; vacuums up to 26 in. of mercury. For higher pressures and vacuums, special equipment will be furnished.

## SEWAGE EJECTOR:

For pumping unscreened sewage or drainage from basements below the street sewer level, handling crude sewage from low level districts, pumping effluent, sludge and other heavy liquids.

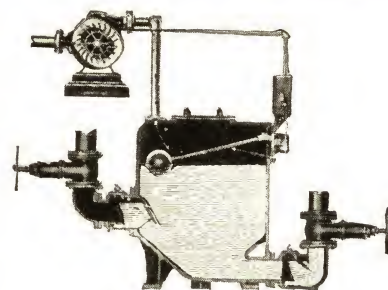
The Jennings Sewage Ejector is of the pneumatic type. Air, compressed to the necessary working pressure by a Nash Hytor Air Compressor, is used as the motive power to pump the accumulated sewage from a pot to the sewer. Air is compressed only to the pressure at which it is used. There are no air storage tanks, reciprocating air compressors or screens. Air valves and reducing valves are avoided.

Operation is as follows: Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates, it raises a ball float which, when the pot is full, actuates a float switch, thereby starting up the Nash Hytor Air Compressor.

Compressed air is delivered into the top of the pot, closing the inlet check valve and expelling the sewage through the outlet check valve. When the pot has

been emptied, the float, having reached the lower limit of its travel, opens float switch stopping compressor, through which, then, the air in the pot is vented. Sewage again flows by gravity into the pot, repeating the cycle.

Furnished in several standard sizes up to 1500 gal. per minute against heads up to 100 ft.



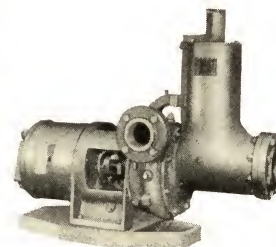
Ejector Discharging

## SUCTION SUMP AND SEWAGE PUMPS, STANDARD TYPE:

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Both pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing. Both are mounted on the same shaft that carries the rotor of the driving electric motor, making possible a single compact assembly.

Capacities and heads to meet all requirements.

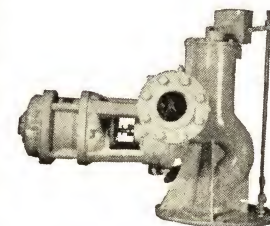


Jennings Motor-Driven Suction Sewage Pump, Standard Type

## SUCTION SUMP AND SEWAGE PUMPS, PEDESTAL TYPE:

Jennings Suction Sump and Sewage Pumps, Pedestal Type, provide even greater convenience and compactness. This type pump is mounted directly on the pit cover and requires no other foundation. The base of the pump fits a standard manhole and, when bolted down, forms a gas tight cover.

Furnished only in medium capacities and heads.



Jennings Motor-Driven Suction Sewage Pump, Pedestal Type

## BULLETINS

- |   |  |
|---|--|
| No. 15 Jennings Return Line Vacuum Steam Heating Pumps, piped-up type | No. 147 Jennings Return Line Vacuum Steam Heating Pumps, unit type |
| No. 17 Jennings Air Line Vacuum Steam Heating Pumps                   | No. 155 Jennings Centrifugal Pumps                                 |
| No. 40 Jennings Flat Box Pumps  | No. 159 Jennings Suction Sump Pumps                                |
| No. 85 Jennings Return Line Vacuum Steam Heating Pumps, manifold type | No. 161 Jennings Suction Sewage Pumps                              |
| No. 99 Jennings Condensation Pumps                                    | No. 188 Jennings Suction Sewage Pumps, pedestal type               |
| No. 103 Jennings Sewage Ejectors, Type B                              | No. 192 Nash Hytor Compressors and Vacuum Pumps, conical type      |
| No. 108 Jennings Sewage Ejectors, Type A                              | No. 203 Jennings Vapor Turbine Return Line Heating Pump            |



# NATIONAL AIROIL BURNER COMPANY

Established 1912

Incorporated 1917

SALESROOM AND OFFICES  
1327 GIRARD AVE., PHILADELPHIA, PA.

FACTORY: Sedgley Avenue and L Street, Philadelphia, Pa.

*Manufacturers of Oil and Gas Burning Equipment*

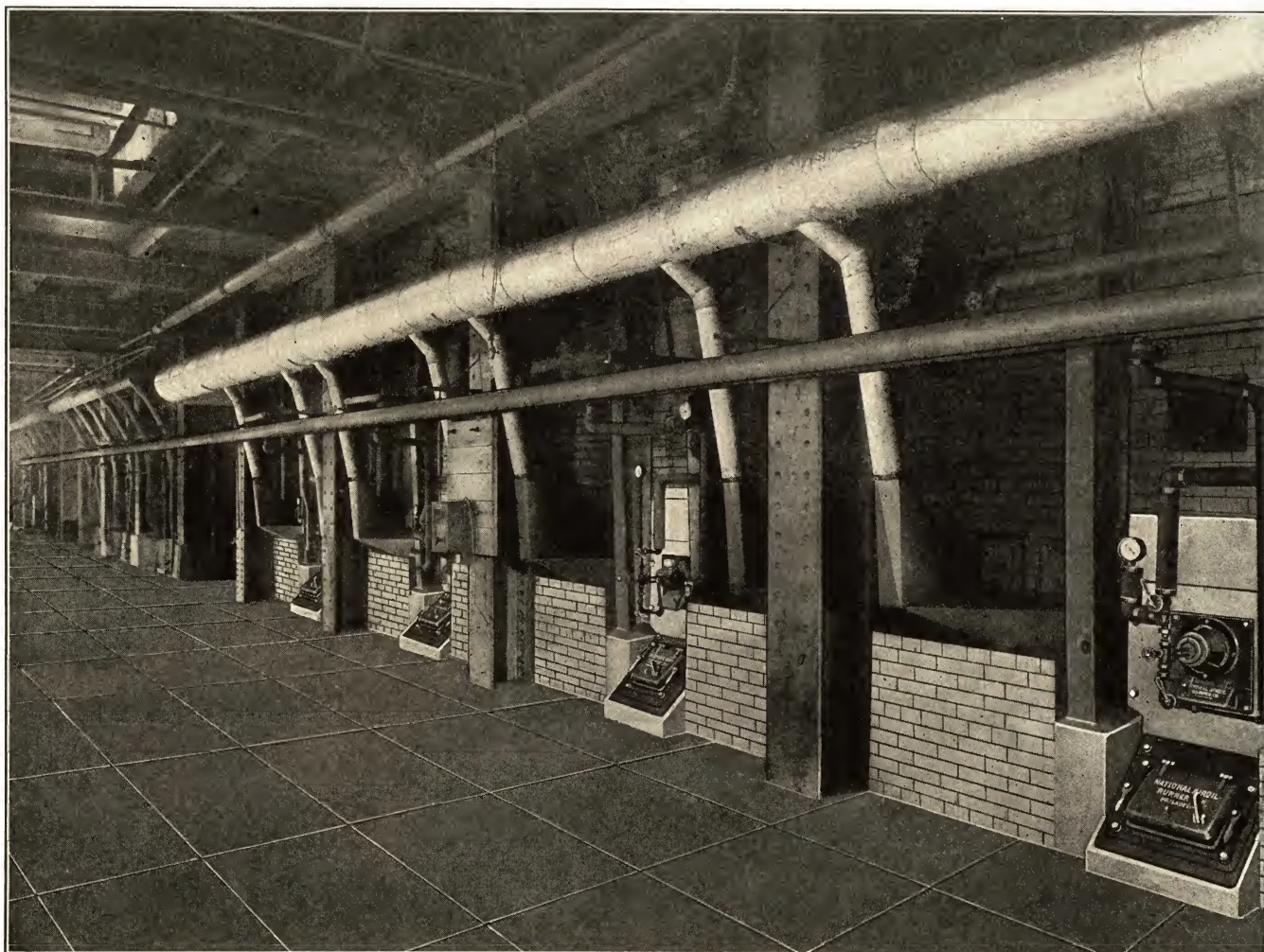
## PRODUCTS:

OIL BURNERS and GAS BURNERS for every industrial purpose:

Steam Atomizing Burners,  
High Air Pressure Atomizing Burners,  
Low Air Pressure Atomizing Burners,  
Air-Turbine-Driven Rotary Burners,  
Motor-Driven Rotary Burners,  
Mechanical-Pressure Atomizing Burners,  
Gas Burners,  
Combination Gas and Oil Burners,



Fuel Oil Pump Sets,  
Steam-Driven Fuel Oil Pumps,  
Electric-Driven Fuel Oil Pumps,  
Pump and Blower Units,  
Fuel Oil Heaters,  
Fuel Oil Strainers,  
Indicating Oil Firing Valves,  
Indicating Steam Control Valves,  
Furnace Windows,  
Refractory Burner Blocks, and  
Other Oil Burner Accessories.



Battery of Furnaces Fired with National Airoil Burners



# NEPTUNE METER COMPANY

50 WEST 50TH STREET, NEW YORK, N. Y.

ATLANTA - BOSTON - CHICAGO - DALLAS - DENVER - KANSAS CITY - LOS ANGELES  
LOUISVILLE - PORTLAND - SAN FRANCISCO  
NEPTUNE NATIONAL METERS, LTD., 345 Sorauren Avenue, TORONTO, ONT.

*Largest Manufacturers of Liquid Meters in the World*

## LIQUID METERS FOR EVERY PURPOSE

Indicating and recording meters and registers for practically every liquid used in or produced by any industrial process are manufactured by the Neptune Meter Company. It is impossible here, in limited space, to present an adequate description of the many different types. On this page are shown just a few in widespread use. The strongest evidence of the



TRADE-MARK

## OVER 6 MILLION MADE AND SOLD

worth of Neptune-built-Meters, for water or any other liquid, is found in the fact that over 6 million of these meters have been made and sold the world over. Their sustained accuracy and their interchangeable parts are your guarantee of maximum service and minimum maintenance and depreciation charges.

## NEPTUNE WATER METERS



**For Ordinary Domestic Service:** Trident and Lambert Split Case Meters, Disc Piston type; embody every known meter improvement; oil enclosed gear train, other features. Sizes  $\frac{5}{8}$ ",  $\frac{3}{4}$ ", 1".

**Where Freezing May Occur:** Trident and Lambert Frost Proof Meters. TRIDENT has cast iron breakable bottom, replaceable. LAMBERT has bolt and split-ring device that yields under pressure and can be used again. Sizes  $\frac{5}{8}$ ",  $\frac{3}{4}$ ", 1".



**For Large Volume Plus Accuracy on Small Flows:** The Trident and Lambert Disc meters. Oil-enclosed gear train, heat proof bushings. All sizes to 6".

**For Largest Industrial Flows:** Both the Trident Crest Meter and the Lambert Current Meter will prove satisfactory. Turbine type. Durable, sensitive, accurate. Sizes  $1\frac{1}{2}$ " to 20".



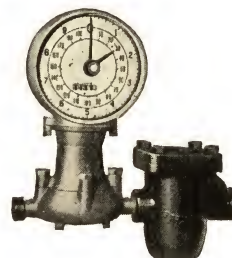
**For Accuracy on Largest, Smallest Flows:** Use Trident Compound Meters or Lambert Current-Duplex Meters. The former is housed in a single casting. Sizes  $1\frac{1}{2}$ " to 10".

**For Fire Service:** Trident Protectus Meter. First officially approved by Underwriters' Laboratories. Combines Trident Crest and Disc Meter. Clear waterway. Sizes 3" to 12".

## NEPTUNE INDUSTRIAL METERS

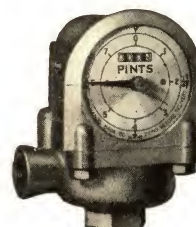
**For Hot Water and Many Other Liquids:** Neptune Meters; Disc Piston Type. Will measure boiler feed, condensate, heating system returns; also oils, gasoline, kerosene, distillates, alcohol, beer, brine, cotton seed oil, glycerine, molasses, paint, turpentine, etc., etc.

**Neptune Grease Meter:** For use on dispensing devices and in service pits. Fitted with totalizer up to 10,000 pints.

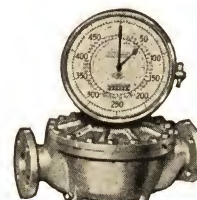


**Neptune "RED SEAL" METERS:** FOR PETROLEUM PRODUCTS: Especially designed for dispensing large quantities of fuel oil, lubricating oil to airplanes, motor boats, tank trucks, tank cars, barges, etc. Precision metering, with but a single moving part. Simplest of piston meters. Horizontal or vertical registers.

**FOR GASOLINE DISPENSING:** Neptune Double Faced Type Red Seal Meter. For filling stations. Guaranteed dependability and accuracy. Positive displacement. 20 gal. dial, bell ringing device.



**Auto-Stop Meters:** Eliminate weighing scales, measuring tanks. Deliver any preset quantity of liquid. Automatically shut off on completion of discharge. Will handle petroleum products, greases, syrups, oils, water.



## TRIDENT REGISTERS

**Recording Register:** A portable recording instrument, used in connection with Trident Meters. Records flow on chart; totals quantity on register below.

**Alarm Register:** Rings a bell or shuts down pump when meter passes predetermined quantity of liquid. Dials up to 400,000 gallons.

**Double Hand Reset Registers:** 6", 9", 11" diameter. Designed for easy reading at a distance. Totalizer not affected by resetting of hands.

## DESCRIPTIVE CATALOGS

and Bulletins covering Trident, Lambert and Neptune Industrial Meters sent on request. Illustrate and describe such features as Oil Enclosed Gear Train, Snap-Joint Disc Chamber, renewable Bushings on Gear Train and Register, and Interlocking Register Construction. These catalogs and bulletins give details of all meters mentioned on this page. Send for your copy.

## NEPTUNE ENGINEERING SERVICE

—is at your service in connection with any problems of measuring, indicating or recording any liquid under any circumstances. Where standard Trident, Lambert or Neptune Meters do not meet your needs, we are prepared to design and manufacture special equipment for special purposes. A visit to our plant in Long Island City will prove interesting.



# THE NEW DEPARTURE MFG. CO.

Division of GENERAL MOTORS CORPORATION  
MAIN OFFICE: BRISTOL, CONN.

Plants at BRISTOL and MERIDEN, CONN.

*Manufacturers of New Departure Ball Bearings*

## BRANCHES

DETROIT, MICH.  
3044 W. Grand Boulevard

LONDON, ENGLAND  
111 Grosvenor Road, S. W. 1

CHICAGO, ILL.  
122 S. Michigan Avenue

SAN FRANCISCO, CAL.  
50 So. Van Ness Avenue

**Foreword:** New Departure Ball Bearings are built in a wide range of types and sizes for use in all industries.

It is important that the correct type be chosen to meet the conditions of each application. In order to render the greatest service New Departure maintains a corps of skilled engineers who will gladly study your individual problems and furnish you with mounting recommendations which include: 1. Computation of bearing loads. 2. Determination of bear-

## NEW DEPARTURE BALL BEARINGS

ing type and size with respect to length of service required. 3. Shaft and housing machining limits. 4. A practical method of lubrication. 5. Suitable enclosures. 6. Kind of lubricant. 7. Suggestions as to alterations in surrounding machine parts which might improve machine performance.

Following is a general description of New Departure types.

## TYPE DESCRIPTIONS

**Single Row:** There are two types of New Departure Single Row Ball Bearings—maximum capacity and non-loading groove. The former is recommended where radial loads are most severe. It is also adaptable for combined loads provided thrust never exceeds 50% of the imposed radial component. The non-loading groove type is more satisfactory for carrying loads of wide angular fluctuations, since it has two-way thrust capacity equivalent to 75% of its radial capacity. For extremely high thrust, the angular contact type, described elsewhere, is more suitable. Single Row New Departures are obtainable in bore sizes from 4 mms. to 110 mms. Tolerances are held within limits specified by the Standards Committee of S.A.E. and where greater accuracy is required, as in delicate instruments and machine tool spindles, New Departure is well equipped to fill your needs with Perfex grade bearings.



Single Row

**Double Row:** The simplest of all supports for parts which must be held rigidly in the face of heavy radial, thrust and combined loads, such as drill spindles, speed-reducer shafts, sheaves, automobile pinions, etc. This bearing really consists of two angular contact ball bearings unified for simplicity and pre-loaded for rigidity. It carries thrust from either direction. It never needs adjusting because its free rolling motion and scientifically designed separators preclude measurable wear. In many instances this unit has replaced two separate bearings of other types, thus saving space and expense. Drawings which show typical mountings will gladly be sent on request.



Double Row

**Radax:** These are single row, angular contact bearings designed to resist radial and thrust loads from one direction. They are usually used in pairs in which case one opposes the other and the supported part is capable of resisting radial and thrust loads from either direction. Where great rigidity is necessary these bearings can be pre-loaded. A snap assembly makes Radax bearings inseparable and users should make sure that thrust is taken on the high shoulders only.



Radax

**Snap Ring Bearings:** Snap ring bearings are designed primarily to simplify the machining of bearing housings with particular reference to such units as automotive transmissions. Internally the bearings are identical with single row radial bearings. The outer races are grooved on the outside diameter near one face so as to accommodate a split steel ring which has sufficient spring to snap into place without radial clearance in the groove. When installed, the snap ring contacts with the housing face thus saving the expense of providing shoulders inside the housing. These bearings may be obtained with shields on one side.



Snap Ring



## THE NEW DEPARTURE MFG. CO.



Flanged Bearing

**Flanged Bearing:** These bearings are designed expressly for support of the various kinds of machine spindles. They are single row angular contact bearings with thrust capacity amounting to 100% of radial capacity. Outer rings can be applied individually to the housings because the bearings are separable. The flanged outer race eliminates shoulders in the housing. Wide inner rings with locking device prevent creeping and deflecting. These bearings are made in bore sizes from 30 to 130 mms. Installation data and typical mountings will be sent on request.

**N-D-Seal:** Equipped with an inbuilt seal of felt and metal to keep out dirt and retain lubricant. Built only in the smaller sizes, this bearing has become very popular with manufacturers of vacuum cleaners, conveyors, motors, fans, portable tools, drink mixers, household appliances and like devices. It is charged with lubricant at delivery and requires no further attention of this sort for several years. For the user it simplifies machining, speeds up assembly, reduces the number of small closure parts, and promotes cleanliness. Booklet "N" describes it fully. Send for a copy.



N-D-Seal

**Double N-D-Seal:** Lubricated for life, this totally enclosed bearing is meant to serve where it is otherwise difficult or impossible to lubricate. The close fitting felts keep out dirt, the greatest cause of wear, and prevent lubricant leakage. Where speeds are high or temperature conditions exceed 170 degrees F. users are advised not to use this unit without first consulting our engineering department.



Double N-D-Seal

**Magneto:** To facilitate the assembly of magnetos or other devices in which these bearings are used, they are made separable so that rings can be applied individually to housings and shafts. Nine standard sizes are available ranging from 8 to 25 mms. bore. Thrust capacity is equal to 35% of radial rating. Magneto bearings are usually applied in pairs opposed under a light load to assure positive contact of balls and races.



Magneto

**Shielded Bearings:** Many types and sizes of New Departure Ball Bearings are obtainable with metal shields on one or both sides. These devices are effective barriers against metal chips and dirt, and also help to retain non-fluid lubricant. Booklet "S" gives a complete listing of shielded New Departures.



Shielded

### ENGINEERING LIBRARY FOR MACHINE BUILDERS

Hand and hand with New Departure's personal engineering service is a wealth of engineering literature, compiled and written here, for the man who must work out many of his own problems.

Any of these valuable booklets will be sent gladly to the engineer who will make use of them. Here is a brief description of the most important ones:

#### Data Book

Dimensions, capacities, prices of standard types. Bearing selection and mounting fits.

#### Handbook

A 300-page book on design, load computation, selection, installation and lubrication of ball bearings. Free to engineers of industrial concerns. To others, \$1.00.

#### Lubrication

The lubrication of ball bearings. Selection of lubricants with reference to bearing size, speed and temperature.

#### N-D-Seal Booklet

Mounting data and advantages of this self-sealed and lubricated bearing.

#### Quality in the Making

A brochure on the materials and processes which contribute to New Departure quality . . . many interesting statistics.

#### Application Book (Industrial)

Practical application of ball bearings to all types of machinery, except automotive.

#### Application Book (Automotive)

Application of ball bearings to component parts of automobiles, trucks, tractors, aircraft and boats. Loose-leaf binder with new pages added at frequent intervals. Available gratis to company engineers and officials. To others, \$1.50.

#### Electric Motors

A discussion of the relative values of plain, ball and roller bearings in electric motors of all types.

#### Service Catalog

Sizes and types of New Departure bearings in passenger cars, trucks and tractors. A replacement guide.

#### Mine Mechanism

Booklets describing the use of self-sealed, self-lubricated bearings for conveyors and mine car wheels.



## NEWARK WIRE CLOTH CO.

369-383 VERONA AVE., NEWARK, N. J.

### SALES OFFICES

CHICAGO, ILL. . . . . John C. Bilek, 43 E. Ohio St., Room 518  
PITTSBURGH, PA. . . . . Frank M. Redpath, 959 Union Trust Bldg.  
SAN FRANCISCO, CAL. . . . . Pacific Metals Co., Ltd.

ALL MESHES  
ALL METALS  
ALL WEAVES



We make the world's finest wire cloth—400 mesh both ways—160,000 square openings per square inch. .001 in. dia., wire; .0015 in. opening.

### PRODUCTS

More than 3000 varieties of Wire Cloth for every industrial service, All Grades, Weaves, Meshes, and Metals, Heavy to Extra Fine; Filter Cloths (Metallic); Gasketed Filter Cloth; Centrifugal Cloths; Laboratory Testing Sieves; A.S.T.M., U. S., and all other recognized standards; Removable Bottom Strainers; Bolting Cloth; Dutch Cloth; End-Shak Sieve Test Machines; Foundry Riddles; Coal and Sand Screens; Wire Cloth for Vibrating Screens; English Picker Cloth; Stainless Steel, Monel Metal, "Nichrome" Cloths; Fabricated Wire Cloth Parts.

### A.S.T.M.-U. S. STANDARD TESTING SIEVES

The "NEWARK" Sieve is the most accurate obtainable. Best workmanship and design. Rigid frame. No corners. All soldering on outside. Cloth quickly and easily replaced. The following diameters are available: 3", 5", 6", 8", 10" and 12".



Half height Newark U. S. Standard Testing Sieves with Cover and Pan



Full height Newark U. S. Standard Testing Sieves with Cover and Pan

### "NEWARK" METALLIC FILTER CLOTH

We originated the Double Dutch Twill weave type, known and used the world over. Requires no rolling to make it lie flat. Special overlap weave. Double surface. Both sides identical. Filters from either side. Wedge shaped openings. Only filtrate can get through. Free and easy discharge of filtrate. Greater strength. Easy to clean. No sharp edges or corners. Adapted to practically all types of filters. Durable. We also developed Gasketed Metallic Filter Cloth for flush-plate and frame filter presses. Available in many styles.

### SAMPLES AND CATALOG

If possible, send sample of wire cloth to be duplicated or bettered. State what cloth will be used for mesh, metal, etc. If you haven't a copy write for our *Catalog No. 32*.



This, our recently erected factory in Newark, N. J., is devoted to our sole specialty—Quality Wire Cloth. Here is where the celebrated "Newark" Spiral Weave Double Face Metallic Filter Cloth is made. Originally developed by us and now used everywhere.

## THE PALMER COMPANY

Established 1872

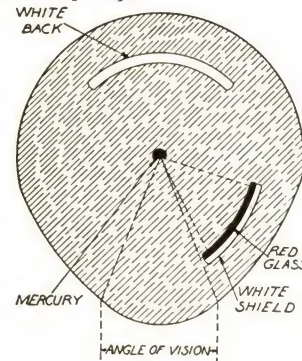
526 CLAY ST., CINCINNATI (ST. BERNARD), OHIO

Manufacturers of the New  
"Red-Reading-Mercury" Indicating Industrial Thermometers

### PALMER "RED-READING-MERCURY" THERMOMETERS:

"As Easy to Read as a Stop Light"

These are pure, clean mercury thermometers which show a bright red color in the reading column instead of the silvery mercury color. Nothing has been added to the mercury to change its purity. The "Red-Reading-Mercury" in the column is accomplished by means of reflection. Mercury is a natural mirror so that by placing a strip of red or colored glass to the side of the bore or reading column, and by having this bore turned to a slant, the red glass is reflected on to the mercury column. Thus when seen through the lens in front of the tube, only the red color is visible. (See illustration.)



Sectional View through Glass

Palmer thermometers are guaranteed for accuracy, A-1 material and workmanship.

Every tube is annealed and treated so that it will not change with age.

### WHEN ORDERING THERMOMETERS:

Remember to specify the following:

- (1) Size of case.
- (2) Style: straight, angle, reclining or inclining, side angle, etc. (a) If reclining or inclining, state degree of angle; (b) If side angle, state right or left.
- (3) Kind of connection.
- (4) Size of thread (if thread connection).
- (5) Length of stem.
- (6) Working temperature or range.
- (7) Fahrenheit, Centigrade, etc., scale.
- (8) Finish: nickelplated, polished brass, etc.
- (9) Purpose for which thermometer is to be used: liquid or air.
- (10) If for oven or room, give thickness of wall.

Notes: On angle type oven or room thermometer it is advisable to have 10 to 12 in. of stem extend into oven or room to get true reading.

Unless otherwise specified, all thermometers are equipped with a strong but very sensitive mercury chamber around bulb. Where air temperature is taken, specify this. For these thermometers, we furnish a perforated stem around bulb, giving protection and allowing air to reach bulb quickly.

Thermometers can be furnished with insulation between case and stem when specified.

In places where thermometers must pass through insulation on pipe or extend a distance from equipment because of obstacles, thermometer can be furnished with extension neck. Specify length needed.

### ENGRAVED LABORATORY THERMOMETERS:

For laboratories, testing departments, etc. High-grade thermometers made of annealed glass, with graduations on the glass tube. Furnished in either plain round front or magnified lens glass.

Metal armor furnished for chemical thermometers.



### CATALOG NO. 200-B:

Write for your copy of our new 68-page illustrated catalog, featuring all types of thermometers.



# NEWPORT NEWS SHIPBUILDING AND DRY DOCK COMPANY

NEWPORT NEWS, VIRGINIA

SALES OFFICE: 90 Broad Street, New York

*Designers and Builders of Hydraulic Turbines and Accessories*

## PRODUCTS:

Hydraulic Turbines	Gates	Gate Hoists
Pressure Regulators	Stoney	Cable
Power Operated Rack	Tainter	Screw
Rakes	Roller	Butterfly Valves
Electrically Welded	Sliding	Penstocks
Trash Racks	Cylinder	Stop Logs



## PENSTOCKS:

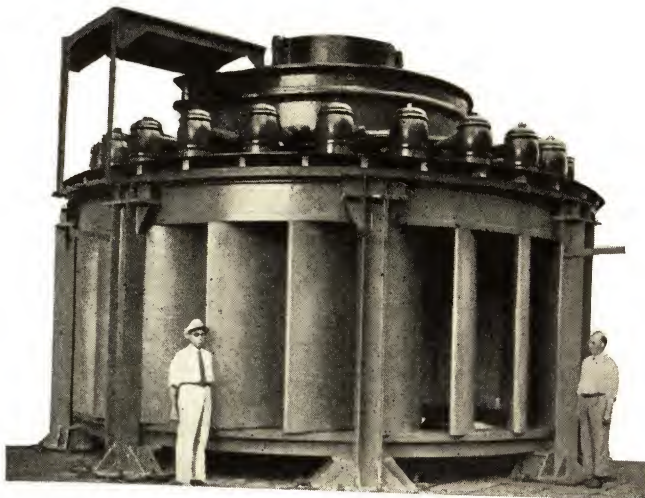
Riveted or welded—manufacturing facilities especially adapted to the fabrication of extra heavy penstocks of large diameters.

## ELECTRICALLY WELDED TRASH RACKS:

Electrically welded throughout, providing a very rigid construction much superior to the old bolt and thimble type.

## HYDRAULIC TURBINES:

**Type:** Reaction, Vertical and Horizontal.  
**Specific Speed:** 20 to 200.  
**Head:** 8 ft. to 1000 ft.  
**Power:** 300 B. H. P. to 130,000 B. H. P.  
**Setting:** Spiral Casing, Cylindrical Casing and Open Flume.  
**Runner:** Francis and Newport News High Speed.  
**Draft Tube:** Conical and Newport News Elbow.



Assembly of Wicket Gates and Operating Mechanism for 57,000 Horsepower Turbine

## POWER OPERATED RACK RAKE (Patented):

A Rack Rake which has proved highly successful at many plants throughout the country.

Built in widths up to 30 feet and furnished complete with guides and hoisting gear.

Will handle all kinds of trash and is of considerable aid in keeping racks clear of frazil and floating ice.

A number of plants using these rakes have reported that they would be unable to operate continuously without them.



Newport News Power Operated Rack Rake with Traveling Hoist

## Recent Rack Rake Installations:

City of Radford..... Radford, Va.  
 One 18'-11" Rack Rake  
 Appalachian Electric Power Company..... Cabin Creek Plant  
 One 7'-6" Rack Rake

## FLOOD GATES, HEAD GATES AND HOISTS:

On work of this character, requiring accurate machining of very large structural units, Newport News shops are especially well



47' x 35' Floating Caisson Gate

## BUTTERFLY VALVES:



Two 6'-0" and One 4'-3" Diameter Butterfly Valves Designed for 440' Static Head

For any head and of any diameter. Exceptional tightness provided by the use of bronze floating seal ring (patented).

**OPERATING MECHANISM:** Screw type, hydraulic cylinder, Newport News Twin-Screw or Newport News Segmental Gear Type.

The two latter types of operating mechanism are based on principles used in marine rudder and battleship turret operation and are particularly well adapted for high head valves of large diameters.

## BOOKLETS:

*Water Power Equipment.*  
*The Newport News Mechanical Rack Rake.*



# NORMA-HOFFMANN BEARINGS CORPORATION

MAIN OFFICE AND FACTORY  
STAMFORD, CONN., U. S. A.

NEW YORK, N. Y. CHICAGO, ILL.  
CLEVELAND, OHIO PITTSBURGH, PA. DETROIT, MICH. CINCINNATI, OHIO

## PRECISION BALL, ROLLER AND THRUST BEARINGS

### **NORMA-HOFFMANN**

The worth of an antifriction bearing is to be measured in terms of its cost per year, or per mile, of service—not by its price. Economy is a matter of performance, not of first cost. Actual records, made under diverse and difficult conditions, constitute the only safe guide in appraising serviceability and true value.

For more than 20 years, in every field of industry and engineering, Norma-Hoffmann Precision Bearings have been distinguished for performance above the ordinary, for dependable serviceability, and for high economy long sustained. There is a Precision Bearing for every load, speed and duty. Twelve of the types more commonly used, out of the comprehensive Norma-Hoffmann line, are here pictured and briefly described.

(1) **Open (Separable) Type Ball Bearings:** Instantly separable into their component parts without the use of tools, thus facilitating mounting, assembly and disassembly.

(2) **Closed Type Radial Ball Bearings:** In a range of metric and inch sizes up to 18½-inch bore; self-contained, non-separable units with deep races, for both radial load and end thrust in either direction.

(3) **Angular Contact Bearings:** Closed, adjustable ball bearings especially adapted for extra heavy thrust load in one direction, as well as radial load.

(4) **Plate (Shielded) Type Ball Bearings:** With one (Type "P") or two (Type "PP") dirt-excluding and grease-retaining labyrinth side plates.

(5) **"7000" Series "Greaseal" Felt-Protected Ball Bearings:** Grease-packed, with dust-and-moisture-proof labyrinth construction; all-steel ball bearings that simplify construction and save machining and assembling costs.

(6) **Double-Row Self-Aligning Ball Bearings:** With an inherent self-aligning feature automatically taking care of misalignment; also furnished with adapter sleeve and nut.

(7) **Standard Cylindrical Roller Bearings:** Heavy-duty, high-speed units for severe radial loads, temporary overloads, shock and vibration; cylindrical rollers, shouldered inner ring, plain outer ring; land-riding, balanced solid bronze cage.

(8) **One-Lipped Cylindrical Roller Bearings:** Identical with No. 7 except that outer ring has one lip or shoulder; suitable for shaft location when used in pairs, with lips in outer rings opposed.

(9) **Two-Lipped Cylindrical Roller Bearings:** Non-separable heavy-duty units with two lips or shoulders on outer ring; suitable for shaft location as well as radial load.

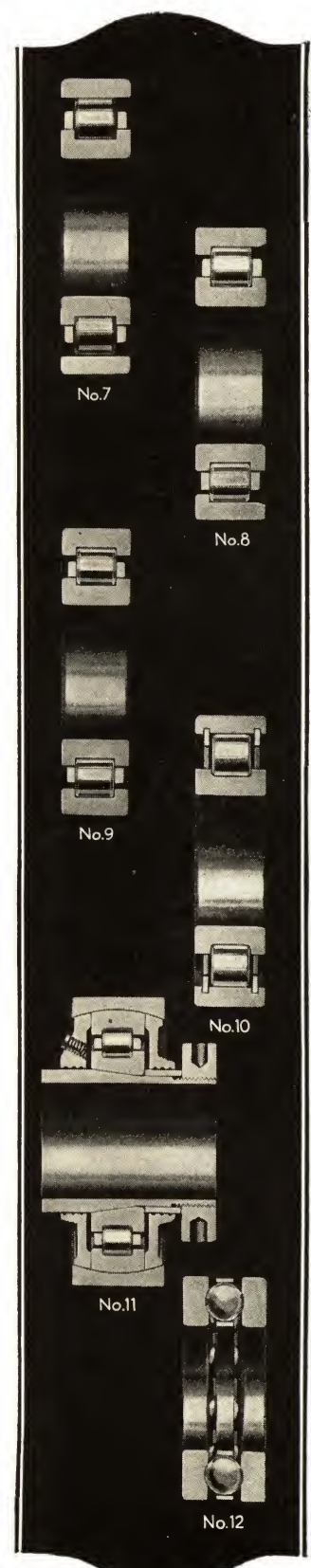
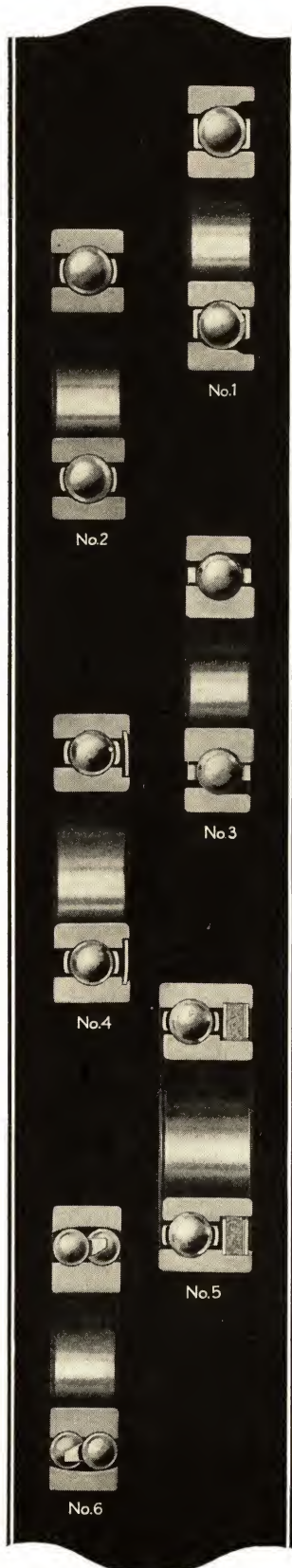
(10) **Full-Roller Type Cylindrical Roller Bearings:** Similar to No. 9 above but self-contained (having retaining rings in outer race) and incorporating no cage; carries maximum number of rollers and has larger load capacity at moderate speeds.

(11) **Self-Aligning Cylindrical Roller Bearings:** Similar to No. 9 above, but with spherical outer ring and grease-retaining, dirt-and-moisture-excluding side plates and adapter sleeve; inherently self-aligning.

(12) **Ball Thrust Bearings:** Single-direction illustrated; furnished also in double-direction type and with self-aligning seats; a range of types adapted to all thrust conditions.

### ENGINEERING SERVICE AND PUBLICATIONS

If the utmost of service and economy is to be realized from antifriction bearings, they must not only be carefully chosen for their specific duties as to size and type, but must also be properly mounted and lubricated. To this end, Norma-Hoffmann engineers will be glad to place at your disposal—without obligation—their exceptional experience in bearing applications for practically every purpose. The complete line of Precision Bearings is described and listed in the Catalogue, gladly sent on request.





# NORTHERN EQUIPMENT COMPANY

MAIN OFFICE AND WORKS  
2340 GROVE DRIVE, ERIE, PA.

*Manufacturers of the COPES System of Boiler Feed Control*

## BRANCH PLANTS

HAMILTON, ONTARIO    PARIS, FRANCE    VIENNA, AUSTRIA    LONDON, ENGLAND    HEIDELBERG, GERMANY    MILAN, ITALY  
Representatives Everywhere

## COPES SYSTEM OF BOILER FEED CONTROL

COPES Regulation provides continuous feed on a working boiler with water level stabilized between fixed limits. This means: Higher overload capacity. Smooth rate of feed. Smoother water and steam charts. Higher feed water temperatures. More constant superheat. Storage of heat at low loads. Drier steam. More even load on feed pump. Minimum wear on pumps, feed lines, valves, etc. Less drop in pressure on overloads. Even distribution of load between boilers of a battery. Fuel saving, 3 per cent. *Write for Catalog 34-M.*



## COPES TYPE BI FEED WATER REGULATOR

Sizes:  $\frac{3}{4}$  to 6 in. Pressures: up to 1800 lbs. Consists of a thermostat, the actuating element, connected by a rigid strut to a balanced valve controlling flow.

**Thermostat:** An expansion tube, in tension, is welded to head and heel pieces and protected throughout its length by heavy channel supports. Upper end of tube is connected to the steam space and lower end to water space of boiler. Any movement of boiler water level causes an immediate and corre-



sponding movement in expansion tube. This acts as a thermostatic relay, transmitting each movement of water level into a powerful force for actuating the valve. A tension relief in the strut prevents undue strain.

**Control Valve:** Closely balanced, rugged and practically frictionless Type BI. Usual sliding stem moving in a stuffing box is replaced by a rotating horizontal lever shaft. Accumulations of dirt on the outside cannot affect the operation or the packing. Stuffing box friction is reduced to less than 2 lbs.

For pressure standards above 250 lbs. control valve bonnet is equipped with outboard ball bearings which support outer end of lever shaft, preserve alignment of shaft in the stuffing box, counteract internal end thrust on shaft and reduce friction.

Valve ports designed for specified flow conditions.

### Outstanding Valve Features—

1. Horizontal rotating lever shaft cuts stuffing box friction to less than two lbs.
2. High valve lift gives close control and reduces wear.
3. Sleeve type or tight-seating pistons can be furnished.
4. Rectangular, "V" or compound ports are accurately designed for the flow conditions specified by the customer.
5. Valve pistons more closely balanced in service than any other make of valve.
6. Valve pistons and seats are easily replaced without taking valve body out of the line.
7. Position of weighted lever indicates amount of valve opening.

## COPES TYPE OT FEED WATER REGULATOR

Sizes:  $\frac{3}{4}$  to 2 in. For a maximum pressure of 250 lbs.

For oil field, horizontal return tubular and Scotch marine boilers. Same principle of operation as Type BI.

Compact. Thermostat, only 37 in. long, is self-supporting on a vertical boiler feed line. Rugged. Expansion tube protected by malleable iron frame. Type BI Valve. *Write for Folder 113-M.*

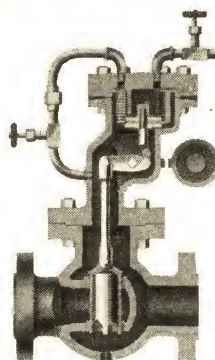


## COPES TYPE SS-2 DIFFERENTIAL VALVE

Sizes:  $\frac{3}{4}$  to 6 in. Pressures: 250 to 600 lbs.

Eliminates varying excess pressure in individual boiler feed lines caused by fluctuating boiler loads, changing friction losses or varying pump pressure. This permits the feed water regulator to feed more closely in accordance with load demands. Smoother flows result, with added increase in efficiency.

Simple, rugged, compact. Accurate. Actuated by a 4-ply brass syphon bellows subjected to and influenced by differential water pressure. Can be installed in horizontal or vertical feed line. *Write for complete details.*



## COPES TYPE SDS-2 PUMP GOVERNOR

Sizes:  $\frac{3}{4}$  to 6 in. Pressures: 250 to 600 lbs.

For service on reciprocating or centrifugal pumps, turbine or motor driven. For excess pressure service in boiler feeding.

Simple, rugged, dependable. Excess pressure regulated by a carefully selected spring. Actuated by a 4-ply brass syphon bellows. Usual sliding valve stem replaced by rotating horizontal lever shaft as in control valve of COPES Type BI Regulator. *Write for Folder 129-M*



## OTHER COPES PRODUCTS

Balanced Valves—for controlling flows of liquids or steam under pressure.  
Condensate Drainage Controls—for intermittent or continuous drainage.  
Excess Pressure Controls for Electric Motor Driven Pumps.  
Feed Water Regulators (types not illustrated on this page):  
COPES Balanced Flow Regulator—balances feed water input against steam flow, correcting for water level changes.  
COPES Double Control Regulator—feeds according to rate of steam flow, correcting for water level changes.  
Type RG-2 Regulator—combines a differential pressure control valve and a type BI Regulator in a single unit.  
Liquid Level Controls—for low- or high-pressure service.  
Low Water Alarms with Fuel Cut-out Valves.  
Motor-operated Valves—for remote control service.  
Phosphate Feeders—for proportioning phosphate to feed flow.  
Solenoid-operated Valves—for remote control service.  
Thrustor-operated Valves—for remote control service.  
Vacuum Governors.  
*Catalog 34-M sent free on request.*



# NORWALK COMPANY, INC.

15 WATER STREET, SOUTH NORWALK, CONN.

*Compressors Exclusively for Over 50 Years*

Sales Offices in Principal Cities

## NORWALK AIR AND GAS COMPRESSORS:

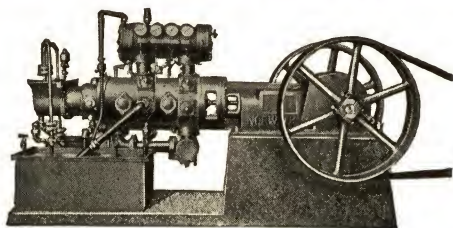
Norwalk Compressors are available in a complete line of sizes, single and multi-stage, and in capacities and for pressures to meet practically all commercial requirements. They are built for handling air and the various gases including carbon-dioxide (liquid, solid, refrigeration), ammonia, oxygen, hydrogen, acetylene, nitrous oxide, also for special chemical and synthetic processes.

Various drives can be furnished including V Belt, long or short flat belt, steam, and direct-connected electric motor, oil or gas engine. Each compressor is designed for a definite service at the lowest possible power consumption and maintenance cost. Reversible ring plate valves are used in both low and high pressure compressors, insuring quiet operation with maximum efficiency.

The types described on this page include only a few of those available for all kinds of service. Several designs of vertical compressors have been built for customers preferring this type. Norwalk engineers are particularly well qualified to specify the most suitable compressing equipment for any air, gas, or special process service.

*Bulletins and complete information gladly furnished upon request.*

## TYPE TB-S4T FOUR STAGE COMPRESSORS:

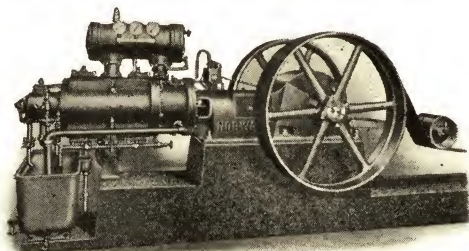


Type TB-S4T

Built for pressures from 2000 to 5000 lbs., and characterized by extremely compact and accessible design covered by Norwalk patents.

Only one stuffing box, enclosed power end, and automatic lubrication are employed. Reversible ring plate valves and double seal piston rings on all stages insure highest efficiency.

## TYPE TB-S3T THREE STAGE COMPRESSORS:



Type TB-S3T

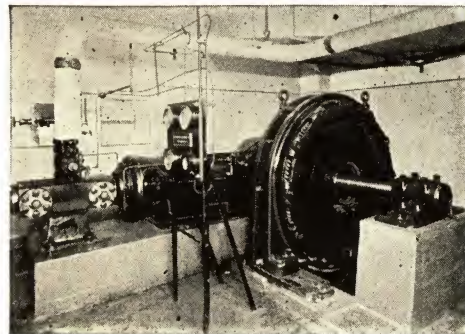
Extensively used for compressing air and gases to various pressures up to 2250 lbs. Possesses similar advantages to Type TB-S4T Four Stage, and requires small floor space.



TRADE-MARK

## TYPE SB-CO CARBON DIOXIDE COMPRESSORS:

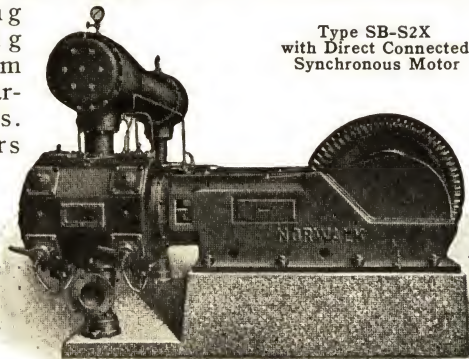
Norwalk Single Stage Carbon-dioxide refrigerating compressors include every modern feature in equipment for this service. Sizes available up to 260 tons.



Type SB-CO Direct Connected Synchronous Motor Drive

## TYPE SB-S2X TWO STAGE COMPRESSORS:

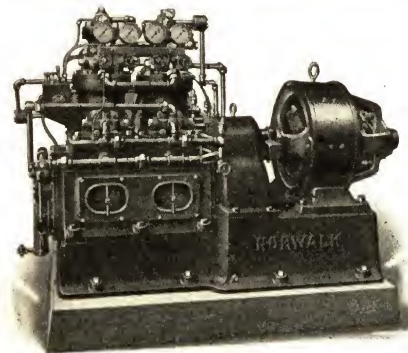
In duplex arrangement, belt or motor drive, these compressors are equipped with Norwalk Proportional Unloading requiring minimum power at various loads. Intercoolers have large cooling surfaces with separately removable bronze tubes.



Type SB-S2X with Direct Connected Synchronous Motor

## TYPE VR VERTICAL COMPRESSORS:

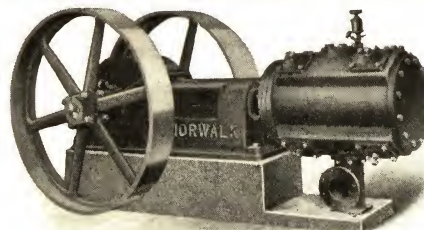
These Vertical Compressors are built in Two, Three and Four Stages and for pressures up to 5000 lb. per sq. in. equipped with Roller Bearings.



Type VR Vertical Compressor

## TYPE TB-S SINGLE STAGE COMPRESSORS:

A complete line available for pressures to 125 lbs. including automatic free inlet unloading with reversible ring plate valves, spacious water jacketing, and automatic lubrication.



Type TB-S



# THE OHIO GREASE COMPANY

MAIN OFFICE AND WORKS  
505 TO 635 N. SPRING ST., LOUDONVILLE, OHIO

*Manufacturers of the Ohio Brand of Lubricating Greases and Oils*

## WAREHOUSES AT

PITTSBURGH, PA.  
PHILADELPHIA, PA.

CHICAGO, ILL.  
ST. LOUIS, MO.

CINCINNATI, O.  
CHARLOTTE, N. C.

NEW ORLEANS, LA.  
SHREVEPORT, LA.

## PRODUCTS:

**Lubricating Greases and Oils:** A complete line of High Grade Industrial and Automotive Lubricants—Greases and Oils for every purpose, including the lubrication



of all kinds of cylinders, bearings, gears, slides, ropes, etc.

**Lubricating Devices:** Grease Compressors, Grease Guns, Grease Cylinder Lubricators and Grease Cups.

## OHIO GREASES:

**Cylinder Grease:** A superlative steam cylinder lubricant. Consists of the best grade of Pennsylvania cylinder stock, properly prepared, scientifically compounded with acidless tallow oil, and highly concentrated. Will greatly improve results and economy on any steam unit regardless of steam or operating conditions.

**Ohio Cup Grease:** A superior lubricant for use through grease compression cups. Contains no fillers and does not discolor with age. Made in six consistencies.

**Ohio Shafting Grease:** An ideal and very economical lubricant for line shafting and other high speed bearings. Made in three consistencies.

**Ohio Pressure Gun Grease:** For use through pressure guns on automotive and industrial bearings. Exceptional lasting and lubricating qualities.

**Ohio Roller Bearing Grease:** A soft grease with excellent wearing qualities. Will not gum, and leaves no deposit. Consistencies for use on roller bearings of all types.

**Ohio Journal Grease:** A most efficient lubricant for use on ring oiling bearings that are steam heated, or on hot bearings of any kind. Also used to saturate woolen waste for journal box lubrication.

**Ohio Mine Car Grease:** An exceptionally good, low cold test lubricant, for roller bearing type of mine car wheel. The thinner consistencies are also suitable for plain bearing, reservoir type wheels.

**Ohio Graphite Grease:** For special service we mix a high grade lubricating graphite with Ohio Cup Grease in any consistency desired.

**Ohio Mica Grease:** Some of our customers prefer powdered mica instead of graphite in their grease, and for such this lubricant is prepared.

**Ohio Fibre Grease:** A moderately high melting point lubricant of spongy or fibrous nature. Particularly adapted for use on bearings that are exposed to heat.

**Ohio Ringoilube:** A liquid grease for the lubrication of ring oiling bearings on all kinds of machinery. Lasts longer and will not creep or drip like oil.

**Ohio Rope Grease:** A perfect lubricant and preservative for steel or manila hoisting and haulage ropes, elevator and crane cables, etc. Two consistencies.

**Ohio Gear Grease:** A first-class lubricant for light, medium or heavy gears of all kinds. Particularly suitable for gears that are not encased, and for gears that are exposed to the weather. Made in three consistencies.

**Ohio Gear Shield:** Not so much a lubricant as it is a very viscous or sticky protective coating for the teeth of large exposed gears in heavy, rough service. Made in three consistencies.

**Ohio Loco Rod Grease:** A light green viscous bearing grease made in very heavy consistencies about as hard as soap. Particularly suited for locomotive rod lubrication.

**Ohio Crank Pin Grease:** A dark green viscous cup grease made from cylinder stock. Will not gum, dry up, or run off. Excellent for crosshead guides, elevator slides, and difficult bearing lubrication.

**Ohio Wool Grease:** Wool yarn, wool waste or wool elastic are saturated with high grade greases for the lubrication of journal boxes on industrial and railroad equipment.

**Ohio Neck Grease:** Hot and cold neck greases are heavy, dark colored lubricants made especially for use on the necks of rolls in steel mills.

**Ohio Auto Grease:** For transmission and differential gears of autos and trucks. Also for housed or encased gearing on any kind of machinery. Three consistencies.

## OHIO OILS:

**Ohio Motor Oil:** A pure Pennsylvania, paraffin base motor oil of the highest possible quality. Suitable for all kinds of automobiles, busses, taxicabs, trucks, tractors, aeroplanes, Diesel oil engines, etc. Six consistencies.

**Hilo Motor Oil:** A fine grade of mid-continent, paraffin base motor oil. Excellent lubricating and lasting qualities. Second only to our "Ohio" brand. Six consistencies.

**Ohio Engine Oil:** A series of quality oils for the lubrication of engine bearings; and for the cylinders of oil engines, gas engines, and gasoline engines.

**Ohio Compressor Oil:** Several grades for the lubrication of air, ammonia, gas, chemical and other types of compressor cylinders.

**Ohio Penetrating Oil:** A very thin paraffin base oil for automobile springs. Loosens rusted nuts, etc. Removes road tar.

**Ohio Hotzone Oil:** For upper motor lubrication. Also for mixing with gas and oil while breaking in new cars. Made with or without colloidal graphite, as desired.

**Miscellaneous Oils:** Sewing Machine Oil, Household Oil, Typewriter Oil, Gun Oil, Electric Motor Oil, and various other lubricants.

## FEEDING EQUIPMENT:

**Ohio Lubricators:** Special hydrostatic lubricators for feeding Ohio Cylinder Grease to steam units of all kinds. They are equipped with heating and atomizing jets and are very efficient. Up feed in two sizes. Drop feed in three sizes.

**Ohio Superheaters:** These instruments are used when Ohio Cylinder Grease is fed through force feed lubricators. They are installed at the point where the feed line from the lubricator enters the steamline or steam chest.

**Ohio Can Gun:** A high pressure, central feed, grease compressor for industrial use. Takes grease from a ten pound can and forces it to any number of bearings, depending upon how distribution lines are arranged.

We do not manufacture, but are in position to furnish force feed lubricators, grease guns, various types of grease cups, etc.



# THE FREDERICK PAGE CONTRACTING CO.

45 EAST 17TH ST., NEW YORK, N. Y.

*Boiler Settings, Boiler Baffle Walls, Furnace and Retort Repairs, Incinerators*

Republic 9-2024  
Milburn 6-1161

Emergency Night Telephones  
Scarsdale 0507  
Stamford 4-0789  
Esplanade 5-6226

Bayside 9-8429  
Orange 5-2376

## THE PAGE SERVICE

The increase in boiler capacities and ratings in steam plants has progressively required greater technical skill, wider experience and better organization on the part of boiler setters.

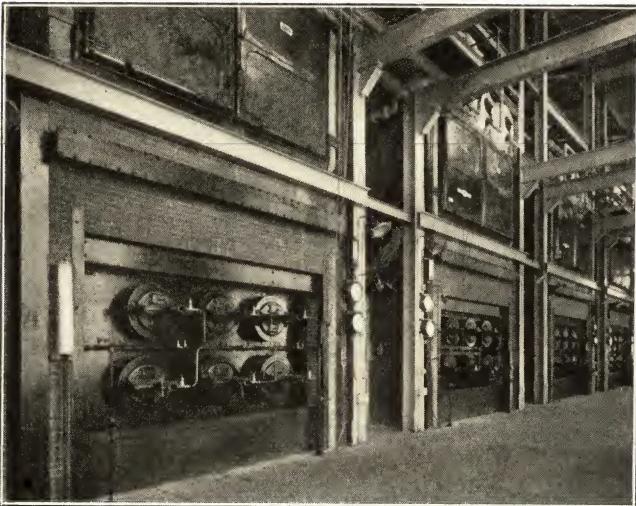
With a sustained reputation for possessing the requisite knowledge and experience, employing a large and well-organized force of skilled boiler masons the year 'round, using quality materials, giving thought and care to details, meeting schedules and asking fair prices, PAGE service is in constant demand by those who recognize the importance of quality workmanship in refractory masonry of any description.



## BOILER SETTINGS

Engineers and owners of plants demanding boiler masonry work which will result in utmost efficiency in operation, are more and more employing PAGE service in all parts of the country. They realize the limitations of local contractors, and appreciate the advantages of dealing with recognized specialists using the superior materials. PAGE service is available to every plant owner anywhere; no plant is too remote to have the benefits of these experienced boiler setters with competent supervision. A few of the many who have realized the value of Page Out-of-Town Service are listed.

Liquid Carbonic Corp.	Dallas, Texas
"	St. Louis, Mo.
"	Cincinnati, Ohio
"	Jacksonville, Fla.
"	Philadelphia, Pa.
"	Albany, N. Y.
"	Boston, Mass.
"	Norfolk, Va.
U. S. Aluminum Co.	Massena, N. Y.
E. R. Squibb & Sons	New Brunswick, N. J.
E. W. Bliss & Co.	Hastings, Mich.
Wm. R. Warner & Co.	Mexico City, Mex.
University of Virginia	Charlottesville, Va.
Susquehanna Silk Mills	Marion, Ohio
N. Y., N. H. & H. Railroad	New Haven, Conn.
Meade Fibre Co.	Kingsport, Tenn.
Central Railroad of New Jersey	Bethlehem, Pa.
Arcadia Knitting Mills	Allentown, Pa.
General Chemical Co.	Marcus Hook, Pa.
Stillwater Worsted Mills	Goshen, Va.
U. S. Leather Co.	Cumberland, Md.



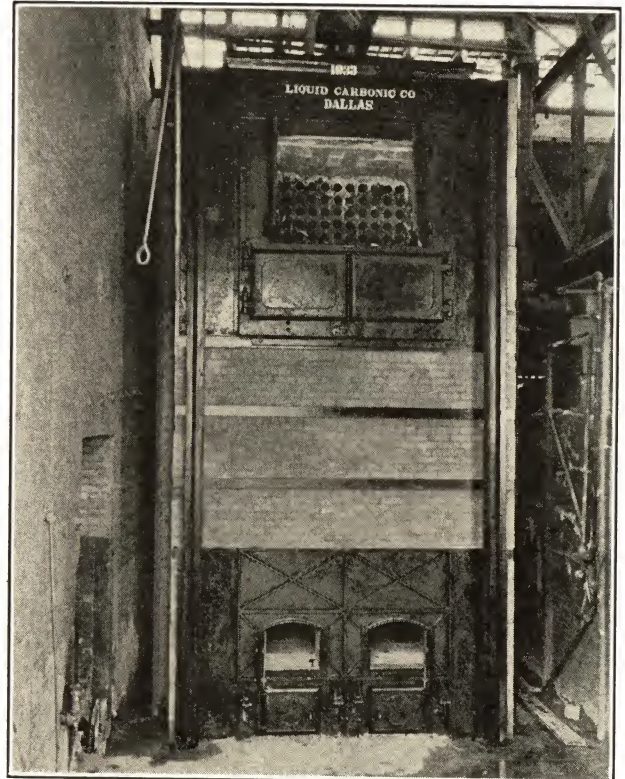
Setting Installation, N. Y., N. H. & H. R. R. Steam Plant,  
New Haven, Conn. Four B. & W. Boilers of 604 H. P. Each

## POLICY

For almost thirty years the PAGE organization has concentrated its efforts in the designing and building of better boiler settings and refractory furnaces. A great deal of time and effort were spent in practical and theoretical experiment to maintain a policy of continual advancement of methods in the interest of better installations. Through its adherence to a sound basic policy the PAGE company has attained a reputation second to none in its field.

## ORGANIZATION

The present high standard of its masonry force is the result of a selective process in which all mechanics are tried, schooled and supervised until they are thoroughly competent to produce the expert quality and quantity of production as required by PAGE. Many of these men have been with this organization for more than twenty years, and in contrast to the major portion of mechanics in this trade, are steadily employed the year 'round. Suggestions from these men for improved methods and constructive ideas are encouraged and rewarded, creating greater interest and incentive in their work.



Liquid Carbonic Corp., Dallas, Texas



# THE FREDERICK PAGE CONTRACTING CO.

## FURNACE REPAIRS—RETORTS

Every day PAGE service handles within a radius of fifty miles of its office, 25 to 30 refractory repair jobs on every type of boiler furnace or heat treating retort, ranging from small jobs of several hours to large jobs requiring weeks. *More than 20,000 of those jobs completed.* Some of them being simple boiler brick work, while others are unusual jobs requiring utmost skill and a thorough knowledge of modern requirements. But—whatever the job, large or small, simple or complex, in every instance PAGE service met the approval of their clients in regard to speed, workmanship and price. An important feature of PAGE service is its ability to handle emergency jobs. In case of a breakdown they have sufficient men distributed throughout the Metropolitan area to rush material and a force to a job on an hour's notice—a feature which in the past has avoided great production losses.

### A Few Users of Page Repair Service

Metropolitan Life Insurance Co.  
U. S. Steel Co.  
New York Stock Exchange  
J. P. Morgan & Co.  
Metropolitan Museum of Art  
New York Life Insurance Co.  
John Wanamaker

Wheatworth, Inc.  
Great A. & P. Tea Co.  
Y. M. C. A.  
Y. W. C. A.  
Rogers-Peet Co.  
Morgan Laundry Co.  
Otis Elevator Co.

## BOILER BAFFLES

FOR INCREASED BOILER EFFICIENCY—DECREASED FUEL CONSUMPTION.

Boiler efficiency depends to a great extent on gas tight baffle walls. Defective baffling is the most common cause of high stack temperatures, with resultant loss in boiler efficiency.

Tile or other similar type baffles are not gas tight and permit a constant fuel loss through high temperature gases taking a short cut to the stack without having done their share toward making steam.

This loss of fuel may be overcome and your boilers operated more efficiently by the installation of PAGE baffle walls. They are built in one solid piece (no tile or metal is used) and hug the walls and tubes closely. All leaks are eliminated, the gas travel controlled and the gases made to cross the tubes several times in passing from the furnace to the stack, resulting in a maximum heat transfer.

The material that is used in the construction of PAGE baffle walls is a specially prepared refractory of the highest grade and will withstand as high temperature as any first-class firebrick. The baffle wall is of the same material throughout and as expansion and contraction are uniform, it will not crack or spall.

Tubes can be withdrawn and replaced without injury to the wall, or if slightly damaged in the removal of bent or blistered tubes, it can be easily repaired.

PAGE baffles are the product of years of careful study and experience and are now recognized standards in water tube boilers. On this recognition have grown their reputation and an ever increasing demand for their use. It is significant that a large percentage of this increase is in repeat order service.

## INCINERATORS

PAGE incinerators are a most satisfactory means of refuse disposal for municipalities, hospitals, hotels, department stores and industrial plants. They are sanitary, convenient and economical.

PAGE has built many types of incinerators, each adapted to the special conditions of the installation—

and every one satisfactory to the owners in design, operation and price. Many years of experience in designing and building of high pressure boiler settings have formed the foundation for the technical skill of its engineers and have enabled PAGE to offer an incinerator installation simple in design, small in operation expense, low in maintenance and slow in depreciation.



Incinerator at Port of New York Authority, Inland Terminal, N. Y.

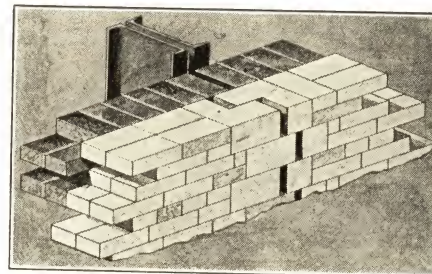
### Some Representative Installations Are

Gimbel Bros.	New York
Roosevelt Hospital	New York
Post Graduate Hospital	New York
Women's Hospital	New York
Museum of Art	New York
Fordham University	New York
New York Trade School	New York
Bloomingtondale Whse & Dept. Store	L. I. City & New York
Stern Bros.' Dept. Store	New York
Abraham & Straus Dept. Store	Brooklyn, N. Y.
Great A. & P. Tea Co.	Garden City, L. I.
U. S. Crematory	Maspeth, L. I.
Royal Baking Powder Co.	Brooklyn, N. Y.
Western Electric Co.	New York
Elks Club	Elmhurst, L. I.
M. Y. Renken Dairy Co.	Brooklyn, N. Y.
Medical Center	Jersey City, N. J.
Thomas Lipton, Inc.	Hoboken, N. J.
Port of New York Authority, Inland Terminal	New York

### PAGE PATENTED "L" EXPANSION BLOCKS

Refractory linings expand under extreme heat, causing walls to crack and bulge when not relieved. PAGE has been one of the first to recognize the necessity of making provisions for this condition, and has, as a result, developed an expansion block made of the highest quality clays to eliminate these common troubles in boiler, furnace and incinerator walls.

By laying the "L" shaped blocks flush with the exposed surface in opposite pairs so that the arms in contact slide as the wall expands, a gas tight slip joint is formed as illustrated.



Method of Page "L" Expansion Block Installation

These blocks are a PAGE development, and their proven performance through their simplicity, practical application, and low cost has resulted in their wide acclaim by designing and operating engineers.



# PANGBORN CORPORATION

GENERAL OFFICE AND PLANT  
P. O. Box No. 859  
HAGERSTOWN, MARYLAND

*World's Largest Manufacturers of Dust Collecting and Blast Cleaning Equipment*

Branch Offices in Principal Cities

## PRODUCTS:

**Blast Cleaning Equipment:** Hose Machines, Cabinets, Barrels, Rotary Tables, Rotative Tables, Blast Cleaning Rooms, Room Cars, Abrasive Separators, Moisture and Oil Separators, Fixtures for Home-Built Rooms, Special Designs.

**Blast Cleaning Accessories and Supplies:** Hose, Nozzles, "Shot-Pruf" Aprons, Rubber Gloves, "Shot-Pruf" Hoods, Ventilated Dustless Helmets, Respirators, Air Filters and Washers.

**Abrasive Handling Equipment:** Separators, Elevators, Spiral Conveyors, Sand Dryers.



**Hydraulic Core-Knockout Equipment:** Removes cores from large castings in a few minutes without bending core-rods and arbors.

**Dust Collecting Equipment:** Dust Collector-Exhauster Systems, Air and Dust Filters. Totally suppresses dust in cement, gypsum, coal and similar fields, also for carbon dust, dried milk, and many other industries.

**Blasting Abrasives:** Angular Steel Grit, Samson Steel Shot, Pangborn Abrasive and Sand Blast Sand.

**Air Equipment—Motors:** Moisture and Oil Separators, Air Compressors, Motors.

## BLAST CLEANING:

Blast Cleaning is the universal method of cleaning Castings, Forgings, Stampings; of carving Stone and Glass; of de-scaling Plates, Sheets and Strips; of preparing metal surfaces for Enamel and Paint, and preparing metal surfaces for Welding. Practical method of cleaning Stone.

### BLAST CLEANING MACHINES:

**For Steel Plates, Sheets, Strip, Billet, Bars:** These machines are built to order for handling any size sheet or plate and may be designed for full surface or marginal blast cleaning. In operation they produce a scale free surface, ideal for welding and forming.

### BLAST CLEANING HOSE MACHINES:

Direct Pressure Type used in room, hygienic cabinet, rotary table, and direct pressure barrel installations. All types and sizes. Also used separately (stationary or portable) to clean structural work, buildings, railroad cars, etc. Suction, open hopper type, for light work.

### BLAST CLEANING CABINETS:

Direct Pressure, Gravity, Suction Types. With manual, mechanical or continuously automatic abrasive reclamation or operation. Self-contained, continuous suction-feed cabinets (for small light work or small volume, gears, stampings, matte finish, frosting glass, etc.) occupy small space. Also Hygienic Cabinet for work usually cleaned in room sand blast and too large for other methods of handling. Special cabinets for truck tire base cleaning, auto pistons, glass bottles, billets, shells, etc.

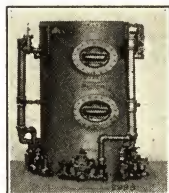
### BLAST CLEANING BARRELS:

Most rapid and economical method for "mass" cleaning. Direct Pressure, Gravity-feed, and Suction types in several sizes; no pit or foundation required. Type "GH-1" with "Loads-Quick" device loads from floor in 30 seconds.

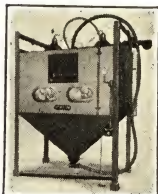
### BLAST CLEANING ROTARY TABLES:

Direct Pressure, Gravity, or Suction-feed. No pit or special foundation required.

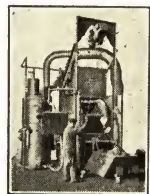
Blasting is entirely confined. Sizes from 4 foot up to 18 foot in diameter. Handles sanitary ware, sinks, tub bases, giving surfaces suitable for enameling with one pass.



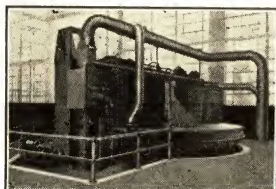
One of the Many Types of Pangborn Blast Cleaning Hose Machines



Pangborn Blast Cleaning Cabinets Are Made in Many Sizes and Types



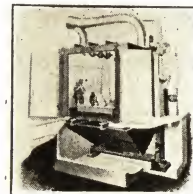
One of Several Pangborn Blast Cleaning Barrels, Made in Several Types and Sizes



18-Foot Pangborn Automatic Rotary Table. Other Types and Sizes to Meet Every Need

## BLAST CLEANING ROOMS:

The Pangborn Daybright, Unobstructible, Down-Draft Ventilated Steel Room is made in sizes from 8 foot square and larger in multiples of two feet in either dimension. Can be equipped



Pangborn Blast Cleaning Rooms Are Made for Every Purpose, in Any Size—None Is Too Small, None Too Large

with rotative table for loading and unloading outside. Can be equipped with bench, car or monorail as required. One of the features of Pangborn Rooms is perfect separation of abrasive for re-use, either sand or steel. The Pangborn Type "M" Room has mechanical abrasive reclamation and separation, handles either sand or steel abrasive without change and with minimum horse power requirements. Also made in pneumatic and gravity abrasive reclamation type. Ventilation can be overmounted or segregated. Conveyor hopper constructed of concrete (integral with foundation) or steel.

## DUST COLLECTING EQUIPMENT:

Pangborn Dust Collectors of Every Size, from the smallest to the largest, are in daily use the world over, for the successful suppression of dusts created in blast cleaning; in processing stone, cement, gypsum, coal; in making dried milk, powdered soap, cocoa, leather products, textiles, monuments, etc.

**The New "CH" Cloth Screen Collector:** The finest, most efficient dust suppression equipment on the market today. New and improved features include all steel, rust proof, non-static wire mesh frames that positively prevent cloth collapse under air load; convenient size and weight screens with positive gasket type seal; all moving parts on clear air side out of dust; unusually effective screen rapping device which has no direct contact with cloth, eliminating wear; maximum cloth area for space available; unit construction permitting unlimited flexibility of arrangement and size; and many other exclusive Pangborn features not found in any other make Collector. Fully pictured and described in new 24 page *Bulletin No. 197*, mailed free upon request.

**The "CD" and "CD-1" Cloth Screen Collector:** The standard Dust Collector for those who do not require the unusual features of the new "CH", but want satisfactory performance and low cost operation in capacities up to 2800 cubic feet air flow per minute. All sizes delivered complete, requiring no assembling or expert erecting.

**Dust Exhausters and Blowers:** The Pangborn line includes exhausters and blowers for all conditions. To determine the type of exhauster best suited, write us the volume of air to be handled, character and amount of dust per cubic foot of air, with sample if possible.

The experience of our Dust Collecting Engineers gained in making hundreds of installations in this Country, Europe, and Australia, is at your service.

## A FEW REPRESENTATIVE USERS OF PANGBORN EQUIPMENT

American Radiator Co.	General Electric Company
Onondaga Pottery Company	International Harvester Co., Inc.
American Steel Foundries	Standard Sanitary Mfg. Co.
Porcelain Enamel & Mfg. Co.	White Motors Corporation
Osgood Bradley Car Co.	Babcock & Wilcox Company
Firth-Sterling Steel Company	Bethlehem Steel Co., Inc.
Parker Rust-Proof Company	Timken Roller Bearing Co.
New York Central Railroad Co.	National Tube Company
Tenn. Coal, Iron & R. R. Co.	American Laundry Machry. Co.
Buick Motor Co.	Bettendorf Company
General Steel Castings Corp.	Chrysler Corporation
Packard Motor Car Co.	Briggs Manufacturing Co.
National Malleable Castings Co.	



The Pangborn Hydro Core-Knockout Is Unexcelled in Rapid Decoring



# PARKER APPLIANCE COMPANY

10320 BEREA ROAD, CLEVELAND, OHIO

*Manufacturers of Tube Couplings, Valves  
and Associated Equipment*

## PARKER THREADLESS PLUMBING

Each thread eliminated in industrial plumbing contributes to economy and safety—the aggregate saving of metal by the elimination of threads in plumbing is tremendous.

Parker Tube Couplings and Fittings have contributed greatly to industrial progress—many industrial installations would be quite impractical without Parker Fittings.



**Parker Standard Tube Couplings:** Parker Tube Couplings are secure and economical. They are listed and stocked in all the commercial metals and alloys; in various weight standards for use with the thinnest wall or the very thickest wall tubes; in every conceivable shape and combination of pipe thread and flared tube outlets; in castings, forgings or bar stock; in all commercial sizes. They meet every industrial demand.

**Parker Triple Tube Couplings:** For close quarters and difficult installation conditions. The Parker Triple Coupling has all the fundamental design features of the Parker Standard Tube Couplings.

**Parker Flange Fittings:** For larger size tubes. This coupling is similar in performance to the Parker Standard Tube Coupling, but the turning torque on the tube is eliminated. Flange fittings may be supplied in 6-in. O.D. tube size, or larger.

**Parker Valves:** Globe, angle, needle, check, taper plug, pressure relief or pressure reducing—in all metals and alloys with flared tube or solder outlets for every class of service—oil, steam, water, gas, chemicals, high or low pressures or temperatures. Parker Valves are of the very highest grade and perform with complete satisfaction in many of the most difficult types of services.

**Parker Tubing:** A very complete inventory of tubes of all proportions and characteristics assures prompt de-

livery of the very highest grade of copper, brass, bronze, carbon steel, stainless steel, aluminum, duralumin, nickel alloy—all properly tempered and heat-treated to meet your requirements most satisfactorily.

## TUBE FABRICATING TOOLS

Tube cutting, bending, flaring, straightening, coiling tools. We build special jigs, fixtures and machines for fabricating tubes to any shape on a production basis.

**Coils and Fabricated Tubes:** We fabricate coils and special shapes to your specification. We furnish many complicated assemblies ready for installation. Careful jiggling and close tolerances assure satisfactory assembly.

**Tube Clips:** Clips and Brackets for mounting tube and fittings. We list an extensive line, and can always furnish special shapes expeditiously and economically.

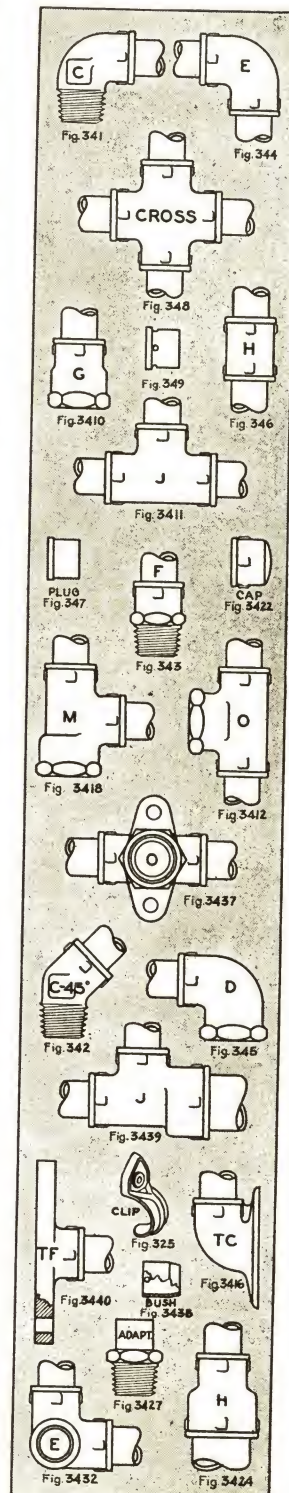
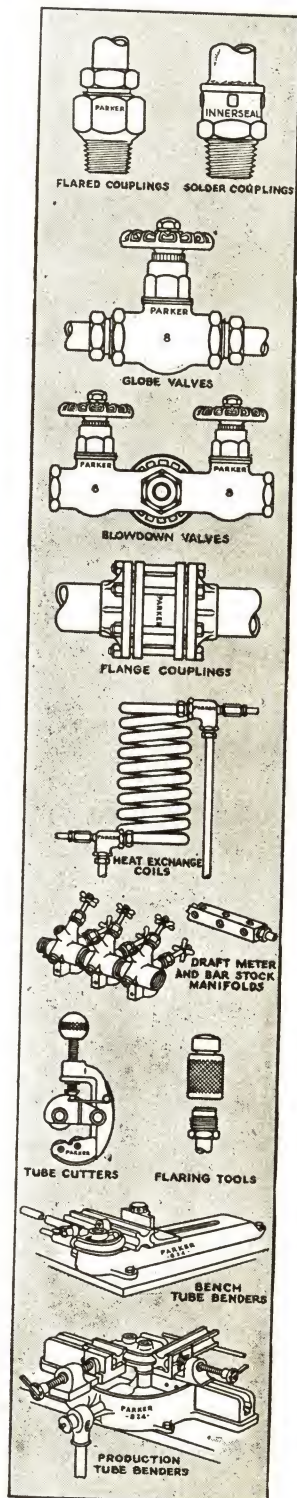
**Solder Fittings:** A very complete line—our "Innerseal" Fitting with its heat indicating color band and "mechanical makeup" features, exclusive in "Innerseal" Fittings is most complete and superior for industrial services where this type of fitting may be advantageously used.

**Accessories: SOLDERS:** In paste or wire form, either soft or hard, and of superior quality for production work, carried in stock at all times.

**Anti-Seize and Thread Compounds:** Valve Lubricants, fluxes and similar chemical products are compounded in our laboratory.

**Plant Facilities Are Complete:** Engineering and production facilities are of the best and at your service at all times. Parker Products are extensively used in practically all of the industries, and many special fittings, particularly designed for difficult services, are carried in stock.

Send for *Bulletin No. 35* for general information on Parker Products.





# PENNSYLVANIA FLEXIBLE METALLIC TUBING CO.

7206 POWERS LANE, PHILADELPHIA, PA.

## BRANCH SALES OFFICES

CHICAGO, ILL. . . . . 162-166 North Clinton St.  
NEW YORK, N. Y. . . . . 30 Church St.  
CLEVELAND, OHIO . . . . . 3030 Euclid Ave.

HOUSTON, TEXAS . . . . . 2410 McKinney Ave.  
BOSTON, MASS. . . . . 230 Congress St.  
NEW ORLEANS, LA. . . . . 908 South Peters St.

## U. S. FLEXIBLE METALLIC TUBING CO.

LOS ANGELES, CAL. . . . . 452 East 3rd St. . . . . SAN FRANCISCO, CAL. . . . . 63 Main St.  
SEATTLE, WASH. . . . . 315 Occidental Ave.

### PRODUCTS:

"PENFLEX" Flexible Metallic Hose, Bronze, Galvanized Steel, Brass, Aluminum, Stainless Steel. "PENFLEX" Pneumatic Rivet Passers, "PENFLEX" Automatic Barrel Fillers.

#### "PENFLEX" PNEUMATIC RIVET PASSER:

This passer delivers scaleless hot rivets, 125 feet horizontally or perpendicularly, without the aid of a passer boy. It eliminates the necessity of the forge being placed within casting distance of the riveter. To operate, connect up with air line. Especially desirable when delivering rivets to high or low points where work is in close quarters. Eliminates accidents caused by careless hand rivet passing. *Send for Bulletin 25A.*



#### "PENFLEX" AUTOMATIC BARREL FILLER:

"Penflex" Barrel Fillers are essentially composed of a float, a pawl, and a trip valve. These fillers will operate on light and heavy oils, liquids, and chemicals. There is no packing employed and there are no projecting parts that can be broken or bent in service.

When the barrel is full the float trips the shut-off valve, thus preventing loss from overflow. No mechanism could be simpler or more reliable. The filler may be equipped with any length and type of hose desired by the customer. *Send for Bulletin 54D.*



#### "PENFLEX" GALVANIZED STEEL HOSE AND COUPLINGS:

This type of "Penflex" hose or flexible steel piping is an all metal product recommended for conveying oil, gasoline, air, gas, hot tar, paint, and all kinds of similar fluids and semi-fluids that will not tend to rust or corrode steel. (For steam and water hose, see heading entitled "Steam Hose.")

This type of hose is capable of withstanding high temperatures and pressures and can be supplied in any length with male or female soldered-on couplings, ground union couplings, or special packed-on couplings for the handling of hot liquids.

Internal diameters in sizes from  $\frac{5}{16}$ " to 12". *Send for Bulletin 59A.*

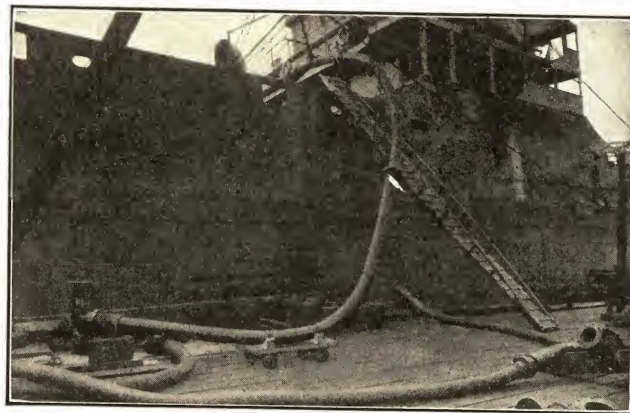


#### "PENFLEX" MARINE HOSE:

This type of flexible metal hose is manufactured for Barges, Tankers, and similar marine uses. It is extremely durable and strong. In fact it is the only type to use for loading and unloading work, being an all metal product.

Standard sizes range from 4" to 12" internal diameter and working pressures from 350 lbs. per square inch to 100 lbs. per square inch for the large size.

Unless otherwise specified, coupling threads are cut to American Standard Gauge. *Send for Bulletin 58B.*



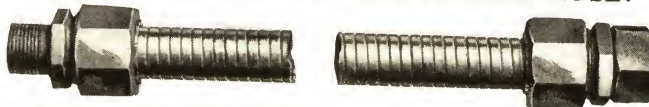
#### "PENFLEX" FLEXIBLE METALLIC GAS HOLDER HEATING HOSE:



"Penflex" Steam Hose is adapted for Gas Holder use and is guaranteed for 200 lbs working pressure. It is flexible and extremely durable. There is a bronze lace covering followed by an asbestos covering which in turn is held tight by a second covering of bronze lacing. An additional covering of half round wire can be supplied on the outside of this flexible piping should additional protection be desired or the asbestos covering may be held by a canvas covering depending on the requirements of our customers.

Male or Female couplings are the well known "Penflex" Clincher type and absolutely steam tight. *Send for Bulletin 57A.*

#### "PENFLEX" FLEXIBLE BRONZE STEAM HOSE:

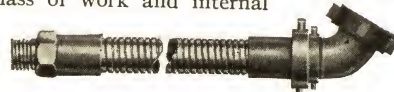


"Penflex" Bronze Steam Hose is adapted to steam or water use wherever a flexible connection is required.

It is of standard four wall construction design with interlocking joints sealing an asbestos packing within. *Send for Bulletin 52D.*

#### "PENFLEX" TANK CAR HEAVY DUTY UNLOADING HOSE:

As its name implies, this type of flexible steel piping is adapted for tank car use. Couplings and connections are stocked in any size and type for this class of work and internal diameters of the hose ranges between 2" and 4". *Send for Bulletin 55C.*





# PENNSYLVANIA PUMP AND COMPRESSOR CO.

MAIN OFFICE AND WORKS: EASTON, PA.

## SALES OFFICES

ATLANTA, GA.  
BOSTON, MASS.  
CHICAGO, ILL.  
CINCINNATI, OHIO  
CLEVELAND, OHIO

COLUMBUS, OHIO  
DALLAS, TEXAS  
DETROIT, MICH.  
GREENSBORO, N. C.

GREENVILLE, S. C.  
HOUSTON, TEX.  
INDIANAPOLIS, IND.  
LOS ANGELES, CAL.

MILWAUKEE, WIS.  
MINNEAPOLIS, MINN.  
NEW HAVEN, CONN.  
NEW YORK, N. Y.

PHILADELPHIA, PA.  
PITTSBURGH, PA.  
READING, PA.  
ROCHESTER, N. Y.

SAN FRANCISCO, CAL.  
SCRANTON, PA.  
ST. LOUIS, MO.  
SEATTLE, WASH.  
TULSA, OKLA.

## PRODUCTS:

Air Compressors, Gas Compressors, Steam Compressors, Water Lubricated Compressors, Vacuum Pumps, Air Lift Pumps, Centrifugal

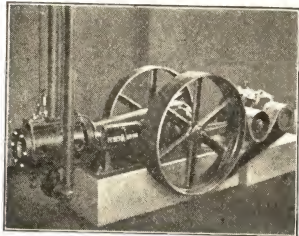


Pumps, Boiler Feed Pumps, Sanitary Pumps, Condensers; After-coolers, Air Receivers.

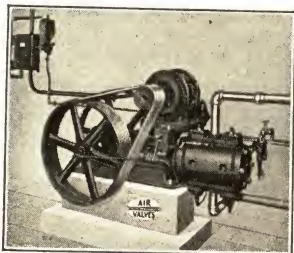
### PENNSYLVANIA AIR COMPRESSORS:

**Important Features:**  
*Air Cushioned* valves, efficient, silent, durable, entirely free from troublesome parts like bolts, nuts or

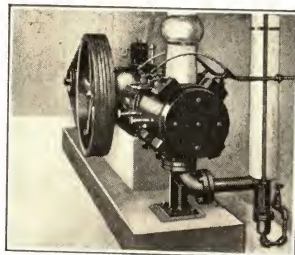
screws. Unusual strength of parts. Bearings of generous proportions. Totally enclosed construction. Convenient accessibility. Improved methods of regulation and control.



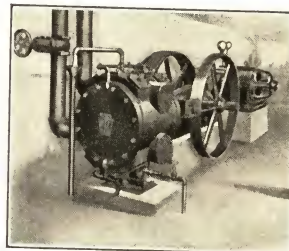
3-A Single-Stage Compressor, Short Belt Drive. Cat. 155-ME



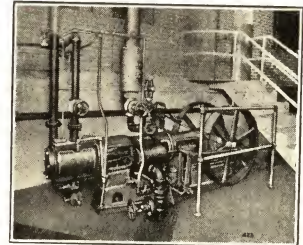
3-A Single-Stage Compressor, Multiple Belt Drive. Cat. 155-ME



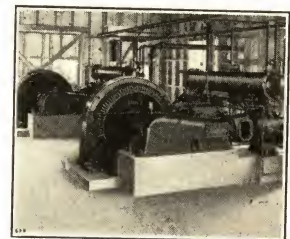
3-A Single-Stage Compressor Adapted for Boosting Steam to Higher Pressures. Cat. 155-ME



7-A Single-Stage Vacuum Pump, Short Belt Drive. Cat. 155-ME

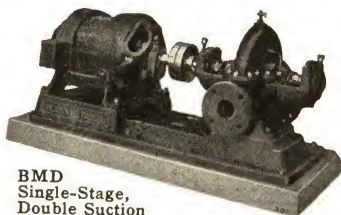


4-A Single-Stage Compressor, Steam Drive. Cat. 155-ME

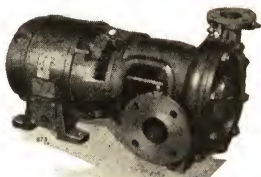


DE Duplex Compressor, Synchronous Motor Drive. Cat. 151-ME

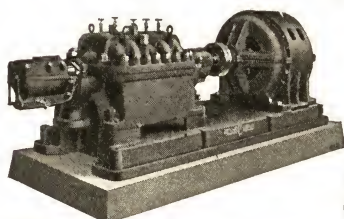
## SINGLE-STAGE, DOUBLE SUCTION CENTRIFUGAL PUMPS:



BMD Single-Stage, Double Suction Ball Bearing Pump



Penn-Motor Pump



OMS Five-Stage Centrifugal Pump

Furnished for capacities up to 3000 g.p.m., against heads up to 300 ft., for medium and high speed service. Equipped with ball or sleeve bearings. Fitted with Chrome Nickel Alloy, Monel Metal and other special metals where conditions of service require. Catalogs 214 and 219-ME.

## SELF-CONTAINED SINGLE-STAGE PUMPS:

Furnished for capacities from 5 to 700 g.p.m. and for heads up to 250 ft. Pump and motor form complete, compact unit. Pump interior accessible without disturbing piping. Catalog 223-ME.

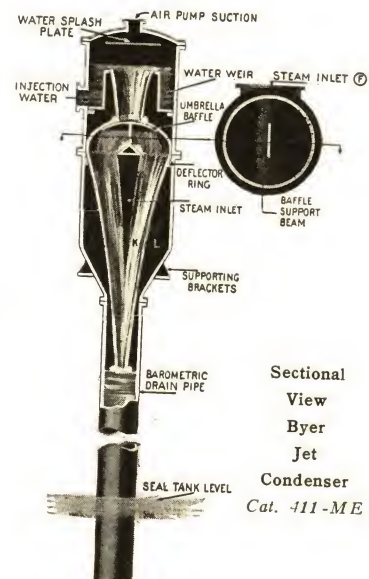
## MULTISTAGE CENTRIFUGAL PUMPS:

Furnished in both

sleeve and ball bearing type for capacities up to 1800 g.p.m. against heads up to 1800 ft. Hydraulic balance is accomplished by placing a properly proportioned distance bushing between the two directly opposed impellers. In this manner positive balance is effected over practically the entire range of the capacity head regardless of the number of stages. Catalog 222-ME.

## CONDENSERS:

Byer Jet Condensers are built as barometric and floor operated types, for all classes of steam condensing operation, sugar refining, chemical manufacturing, petroleum refining, food products, or any operation requiring the condensing of steam or vapor or cooling gases by direct contact between water and mixtures handled. Simplicity of internal construction with automatic vacuum regulation, salient features of design.



Sectional View Byer Jet Condenser Cat. 411-ME



# THE PERMUTIT COMPANY

330 WEST 42ND STREET, NEW YORK, N. Y.

Telephone  
BRyant 9-9050

*World's Largest Exclusive Makers of Water Treating Equipment  
All Types—All Sizes—For All Purposes*

Cable Address:  
"PERMUTIT New York"

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CHATTANOOGA, TENN. . . . . 411 Provident Bldg.  
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LOS ANGELES, CAL. . . . . 909 Wright and Callender Bldg.  
PHILADELPHIA, PA. . . . . 34 South 17th St.  
PITTSBURGH, PA. . . . . 402 Dollar Savings & Trust Bldg.  
ST. LOUIS, MO. . . . . 4064 Olive St.

PERMUTIT COMPANY OF CANADA, LTD.

## AGENTS

CALGARY, ALB. . . . . Stanley Brock, Ltd., 535 Tenth Ave., W.  
TORONTO, ONT. . . . . Busfield McLeod, Ltd., 73 Adelaide St., W.

MONTREAL, QUE. . . . . Busfield McLeod, Ltd., 1440 St. Catherine St., W.  
WINNIPEG, MAN. . . . . Stanley Brock, Ltd., 145 Market St., E.

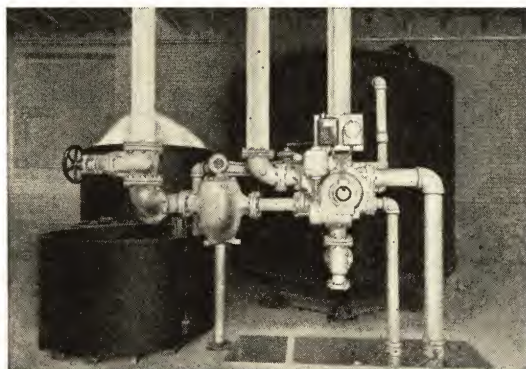
## PRODUCTS

A complete line of Water Treating Equipment including: Manually operated and fully automatic downflow and upflow zeolite water softeners; porous and non-porous zeolites; hot process and cold process intermittent and continuous lime soda water softeners; pressure and gravity filters; taste, color, and odor removing equipment; activated carbon filters; coagulant and corrective chemical feeds; iron and manganese removal equipment; continuous blowoff equipment; anti-corrosion equipment; carbon dioxide recorders; etc.

### PERMUTIT ZEOLITE WATER SOFTENERS

Completely remove the hardness from water by base-exchange, furnishing a non-scale-forming effluent. Built in a wide range of sizes—Vertical Types from less than 1 ft. to 10 ft. in diameter—Horizontal Types 10 ft. in diameter and up to 25 ft. in length. Furnished with either Porous or Non-Porous Zeolites.

### NEW FULLY AUTOMATIC ZEOLITE WATER SOFTENER



The latest development is the new Permutit fully automatic Zeolite Water Softener, shown above. By substituting precise automatic control for manual operation, higher efficiencies and greater economies are realized. These fully automatic controls may be applied to existing downflow types of softeners. Write for full information.

### PERMUTIT WATER FILTERS

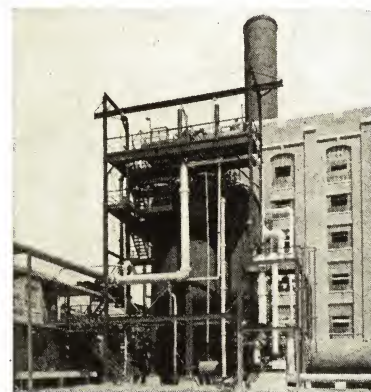
Permutit Filters are built in a wide range of sizes and types to cover all requirements. Steel shell pressure filters, vertical type, from 30 to 120 in. in diameter; horizontal type 8 ft. in diameter and from 10 ft. 6 in. to 25 ft. in length. Gravity filters of wood or concrete construction built to suit requirements.

### PERMUTIT CHEMICAL FEEDS

All types of chemical feeds, constant or proportionating, for feeding coagulants, soda, phosphate, silicate, acid, lime, clay, etc.

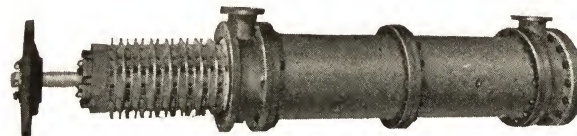
### PERMUTIT HOT LIME SODA WATER SOFTENER

Correctly proportioned dosages of lime and soda ash precipitate the bulk of the hardness as calcium carbonate and magnesium hydroxide. The sludge formed is settled out in the settling tank, after which the water is filtered. This process reduces the hardness to about  $1\frac{1}{2}$  to 2 grains per gallon.



A 2,500,000 Gpd. Permutit  
Hot Lime Soda Water Softener

### PERMUTIT CONTINUOUS BOILER BLOWOFF EQUIPMENT



Maintains a uniform concentration of salts in the boiler salines and recovers the heat from the blowoff by means of the new, rugged, highly efficient plate-type heat exchanger illustrated above.

### RANAREX CO<sub>2</sub> INDICATOR AND RECORDER

A completely mechanical CO<sub>2</sub> recorder of very rugged construction. Gives a constant record of combustion conditions. Large dial can easily be read 30 ft. away. Time-lag less than one minute.

### PARTIAL LIST OF PERMUTIT BULLETINS

- (1) "No Scale, No Sludge, No Mud"—Zeolite softening. 44 pages illustrated, tabulated data, conversion tables, factors, etc.
- (2) "Hot Lime Soda Water Softening." 24 pages illustrated, conversion tables, method of calculating chemical charges, etc.
- (3) "Water Filters and Filtration Equipment." 28 pages illustrated, filter principles, design, types of chemical feeds, etc.
- (4) "How to Save Fuel and Improve Steam Quality with Permutit Continuous Blowoff Equipment." 20 pages illustrated, diagrams, principles of operation, applications, etc.
- (5) "Ranarex—The Mechanical CO<sub>2</sub> Indicator and Recorder." Illustrated leaflet describing principles and application.

The above list represents but a few of our bulletins on special subjects, any of which may be obtained free on request. Kindly order by name.



# PHILADELPHIA GEAR WORKS

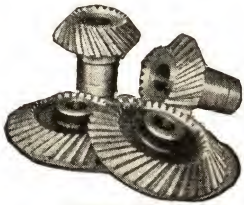
ERIE AVE. AND G STREET, PHILADELPHIA, PA.

*Manufacturers of Gears and Speed Reducing Units*

BRANCH SALES AND ENGINEERING OFFICES

NEW YORK, N. Y. . . . 330 West 42nd St.

PITTSBURGH, PA. . . . . Magee Bldg.



Spiral—Bevel  
Gears and Pinions

Also the Philadelphia MotoReduceR.

## PRODUCTS

Gears of all sizes, types and materials, including: Spur, Bevel, Spiral, Mitre, Herringbone, Worm, Helical, Internal, Fabroil, Textolite and Rawhide. Racks, Ratchets. Sprockets and Chains. Speed Reduction Units of all types, sizes and ratios.

speed reduction units available in spur, worm, herringbone, spur and bevel, and spiral-bevel herringbone gear types. They are compact, power saving, quiet, safe, dirt-proof and moisture-proof, long-lived and very low in maintenance cost. They are built of the highest grade materials and offer straight line, right angle or vertical drive.

## CONTINUOUS TOOTH HERRINGBONE GEARS

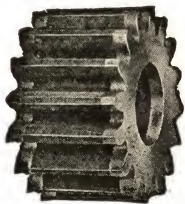
Especially adapted for heavy-duty drives when continuous service is required and where high efficiency of operation is an important factor. Used extensively for hoisting machinery. Also suitable to use for speed-increasing gear trains, at lower ratios. Our equipment will produce herringbone gears either with or without the gap at the center, in sizes up to 160 in. in diameter, 36-in. face, in any pitch or material.



Continuous Tooth  
Herringbone Gears

## SPIRAL BEVEL GEARS

These gears are made in various sizes and materials. They insure smooth operation, freedom from vibration, great tooth contact and are suitable for use where a right angle drive is required.



Fabroil Gear

## SILENT (NON-METALLIC) GEARS AND PINIONS

Where silence and shock absorption are important factors, we recommend the use of Fabroil, Textolite or Rawhide gears. They are not affected by oil, water, acid or alkali solutions. We can give 24-hour service on ordinary sizes and types.

## PHILADELPHIA FLEXIBLE COUPLINGS

For the correction of misalignment and absorption of shocks, we make the following types of flexible couplings: Philadelphia Flexible Couplings, Oldham Couplings and Thermoid Couplings. We also produce the Philadelphia Hy-Speed Couplings. Ask for literature.

## PHILADELPHIA SPEED REDUCING UNITS

We have perfected a complete line of



Type AT Worm Gear Speed Reducer



Philadelphia MotoReduceR (Horizontal Type)



Philadelphia MotoReduceR  
(Vertical Type)

## PHILADELPHIA "MotoReduceR"

These "features" of the Philadelphia MotoReduceR challenge comparison: Extremely compact, offering considerable saving in space. . . . Permanently accurate alignment. . . . High operating efficiency. . . . Minimum of maintenance cost. . . . No overhung motors or gear cases. . . . Perfectly balanced. . . . Greater stability. . . . Freedom from vibration. Practically noiseless. . . . All parts easily accessible. . . . Requires no flexible couplings or base plates. . . . Positive lubrication is assured by complete oil bath. . . . Built to withstand heavy overhung load.

The MotoReduceR is available in single, double and triple types with ratios up to 450:1—and can be furnished with standard open type or totally enclosed fan cooled motors, polyphase and single phase. Also available with direct current motors up to 10 h.p.

Write for an illustrated Catalog on the MotoReduceR.



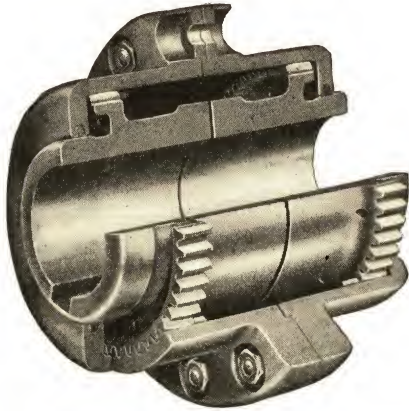
# POOLE FOUNDRY & MACHINE COMPANY

MAIN OFFICE AND FACTORY  
BALTIMORE, MD.

*Manufacturers of Gears, Flexible Couplings and Speed Reducers  
Special Machinery*

## FLEXIBLE COUPLINGS

The POOLE Patented Flexible Coupling has been developed to meet the popular demand for a reliable and efficient flexible coupling, correctly designed to cover all flexible coupling requirements. POOLE Flexible Couplings have been in continuous service for over seven years and are now being manufactured in various types to suit all service conditions.



**Features:** The POOLE Flexible Coupling is simple in design, composed of few parts, which are easy to assemble. It has no springs to crystallize and break, and no pins or bushings to require frequent replacement. It is self-aligning, with no binding action at any point of its revolution, its floating sleeves supported on crowned teeth being as free to align themselves as a ball and socket joint. It can be used on reversing service without noise or vibration. It has more strength than the connecting shafts. This means that when the shaft size is correct, the coupling can be ordered to suit the shaft, regardless of load, speeds or utility factors.

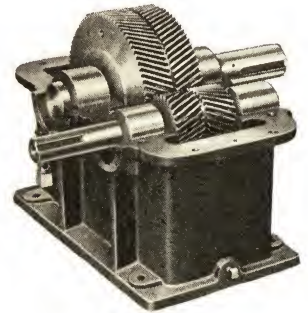
The POOLE Flexible Coupling is especially suited for high speeds as each half is in perfect balance and concentrically supported on its own shaft. It presents a smooth exterior surface with no protruding parts. Bolt heads and nuts are fully protected. Its rugged construction with large bearing surfaces make it equally desirable for heavy duty slow speed drives.

**Operation:** POOLE Flexible Couplings carry their load on crowned gear teeth formed on the periphery of each shaft hub, which mesh with corresponding teeth on the interior of a floating and connecting sleeve member. This construction permits large bearing surfaces and low unit stresses to transmit the load. In case of shaft misalignment, the crowned teeth allow the floating sleeve to rock and assume a neutral position without binding action as the shafts rotate. The gear teeth are the only parts in contact and they are continually submerged in oil under centrifugal pressure while running, which ensures ample lubrication and the practical elimination of friction and wear. We know of no other coupling embodying this most essential design which, in itself, safeguards the machinery against sudden breakdown.

Full data, dimensions, weights, horsepower ratings, etc., described in our *Flexible Coupling Handbook*.

## SPEED REDUCERS

The POOLE Speed Reducer is a self-contained speed transformer interposed between and directly coupled to the prime mover and driven unit and can be used for either increasing or decreasing speeds. The gear members consist of double helical or herringbone gears and pinions made of special analysis open-hearth steel forgings, heat treated. The herringbone pinions are cut integral with the high-speed shaft and made of chrome vanadium steel, heat treated to proper hardness to minimize wear.



The gear members are totally enclosed in gray iron casings, split horizontally, affording perfect accessibility to all internal parts.

Anti-friction bearings (either ball or roller type) are used throughout.

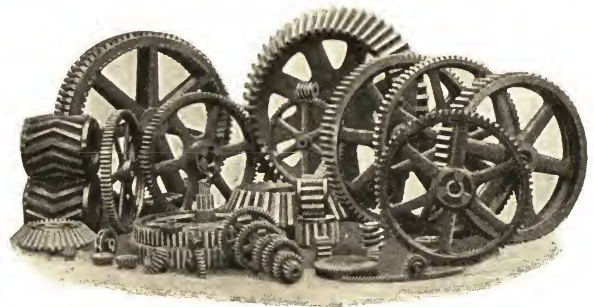
Thorough lubrication is obtained by an improved splash and gravity system, which supplies all moving parts.

POOLE Speed Transformers may be run in either direction.

Full data, horsepower ratings, sizes, etc., described in *Catalog RD-33*.

## GEARS

We have available approximately 16,000 different patterns of every type, kind and size, ranging from a few inches in diameter up to 20 feet in diameter or over. Whenever gears of special sizes or types are required and our standard patterns can not be used, we can, by our system of machine moulding gears, make very promptly and at a very small charge anything in the gear line. The machine moulded method of making gears produces gears of extreme accuracy and free from warpage and other distortions you will find in pattern made gears. All listed in our new catalog, copy free.





# THE POWERS REGULATOR CO.

GENERAL OFFICES AND FACTORY: 2726 GREENVIEW AVENUE, CHICAGO, ILL.

GENERAL EASTERN OFFICES: 231 East 46th St., New York, N. Y.

CANADIAN POWERS REGULATOR CO., LTD., 106 Lombard St., Toronto, Ont.

*40 Years of Specialization in Temperature Control*

ATLANTA	BUTTE, MONT.	DALLAS	HIGH POINT, N. C.	MEMPHIS	PHILADELPHIA	ST. LOUIS	SYRACUSE
BALTIMORE	CHATTANOOGA	DAVENPORT	HOUSTON	MILWAUKEE	PITTSBURGH	SALT LAKE CITY	CALGARY
BIRMINGHAM	CINCINNATI	DENVER	INDIANAPOLIS	MINNEAPOLIS	PORTLAND	SAN ANTONIO	MONTREAL
BOSTON	CLEVELAND	DETROIT	KANSAS CITY	NASHVILLE	READING	SAN FRANCISCO	VANCOUVER
BUFFALO	COLUMBUS	EL PASO	LOS ANGELES	NEW ORLEANS	ROCHESTER	SEATTLE	WINNIPEG

## PRODUCTS

Systems of automatic temperature and humidity control for heating, ventilating, and air conditioning equipment.

Automatic temperature and humidity regulators for industrial processes.

Mixing valves—thermostatic and pressure equalizing valve types for automatically mixing hot and cold water, or steam and cold water, capacities 3 to 1700 gals. per min.

High pressure steam traps, dial indicating thermometers, and pressure reducing valves.

## QUICK SERVICE

With competent engineers in 43 cities, we are able to give prompt and intelligent service whenever necessary. Forty years of specialization in Automatic Temperature Control serving the leading industrial firms and manufacturers of air conditioning equipment, has given us a wealth of knowledge and experience from which you can draw in selecting the proper type of control for any purpose.

**Style K Thermostat (Compressed Air Type)**

**Style D Thermostat (Compressed Air Type)**

**Duct Thermostat (Compressed Air Type)**

**Hygrostat (Compressed Air Type)**

**No. 14 Temperature Regulator (Compressed Air Type)**

**No. 21 Temperature Regulator (Compressed Air Type)**

**Style K Rigid Stem Thermostat (Compressed Air Type)**

**Thermostat and Hygrostat Combination (Compressed Air Type)**

**Compressed Air Relay for Amplifying Action of Thermostats and Regulators**

**Compressed Air Switch for Manual Operation of Diaphragm Valves and Dampers**

**Style K Thermostat with Flexible Tubing and Bulb (Compressed Air Type)**

**No. 16 Temperature Regulators for Unit Heaters, Ventilating Units, Brine Coils, etc. (Self Operated)**

**All Metal Radiator Valve (Compressed Air Operated)**

**All Metal Diaphragm Valve (Compressed Air Operated)**

**No. 11 Temperature Regulator for Hot-Water Heaters, etc. (Self Operated)**

**No. 15 Temperature Regulator for Dryers, Ventilating Units, etc. (Self Operated)**

**All Metal Dampers and Motors (Compressed Air Operated)**

**Thermostatic Water Controller for Mixing Hot and Cold Water**



# PRESSED STEEL TANK COMPANY

GENERAL OFFICES AND PLANT  
6625 GREENFIELD AVENUE, MILWAUKEE, WIS.

CHICAGO OFFICE: 208 S. LaSalle St. Bldg., Room 1129  
NEW YORK OFFICE: 1305 Vanderbilt Concourse Building  
LOS ANGELES OFFICE: 672 Roosevelt Building

*Manufacturers of Containers for Gases, Liquids and Solids*

## PRODUCTS:

Seamless and welded, removable head and tight-head Barrels and Drums; Cylinders; Tanks; and Specially Constructed Shapes in many metals.

## THE COMPANY:

Pressed Steel Tank Company are one of the oldest and largest manufacturers of steel barrels, drums, cylinders and deep drawn containers in the world. Pressed Steel Tank Company are well equipped for the design and construction of containers for special use; and are familiar with many metals, such as copper, nickel, aluminum and their alloys, brass, monel metal, as well as steel.

## HACKNEY SPECIAL SHAPES:



Hackney engineers will gladly work with any user of metal containers for gases, liquids or solids—to determine accurately whether his needs can be answered in deep drawn seamless shapes. Hackney has designed and built countless special shapes.

Extreme left—a seamless shell for use as torpedo nose. Left—Special tapered shell made from one continuous piece of steel without joint.

## HACKNEY LIQUID FUEL CYLINDERS:

Hackney Cylinders have been on the market for more than 20 years, and have proved their dependability to safely and economically deliver their contents to the consumer. Many large companies are users of Hackney Cylinders.

Built to meet I. C. C. Specifications. Safety devices approved by Bureau of Explosives. Each cylinder tested with air at pressure equal to design pressure and hydrostatically to at least 5/3 times design pressure. To prevent both fragmentation and scale formation, cylinders are subjected to special heat treatment after complete assembly. Hackney cylinders are designed to resist rough handling and extreme weather conditions. Cylinder produced for Ammonia, Chlorine, Liquefied Petroleum Gas, Phosgene, Sulphur Dioxide, Methyl Chloride, etc.

Left—Spun type cylinder, entirely seamless from top to bottom. Open end spun inwardly.

Extreme Left—Cylinder constructed from one seamless shell with integral head—having open end closed by means of separate welded bottom.

## HACKNEY SEAMLESS TANKS:



Pressed Steel Tank Company produce a complete line of air receiver and other pneumatic tanks. They can be made to comply in every detail with A.S.M.E. Code, Canadian Code or special specifications. Receivers to be used in any location on this continent are produced. It is possible through use of seamless tanks to obtain one style of tank which will meet requirements of all codes.

At Extreme Left—Tank used in grease dispensing. At Left—Seamless tank for use with gasoline or oil burners.

## HACKNEY BARRELS AND DRUMS WITH THREADED OPENINGS:

For shipment of liquids, inflammable, corrosive, dangerous or non-hazardous—Pressed Steel Tank Company have designed steel barrels and drums in standard sizes to meet practically every shipping need. Famous Hackney raised openings set in special arched

**Hackney**  
MILWAUKEE  
TRADE-MARK

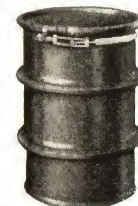
chime can be furnished on all sizes of containers. Raised openings set so that water or foreign matter will not enter even when plugs are removed—and allow container to drain dry. Chime and openings are so strongly constructed that they will withstand severe abuse. Bung fittings of forged steel; heads are locked to body and brazed into leak-proof joint. Complete range of sizes of seamless two-piece and three-piece construction—tinned or galvanized by Hot Dip process, which insures a smooth, even coating.

Light Shippers are also produced by Pressed Steel Tank Company. Rigid inspection and care are used in their production. Safe delivery of their contents is assured. Expanded rolling hoops. Threaded openings, full removable head or friction cover. 55, 50, 30, 15-gallon sizes.

Light Shippers are also produced by Pressed Steel Tank Company. Rigid inspection and care are used in their production. Safe delivery of their contents is assured. Expanded rolling hoops. Threaded openings, full removable head or friction cover. 55, 50, 30, 15-gallon sizes.

## HACKNEY REMOVABLE HEAD BARRELS AND DRUMS:

Hackney removable head barrels and drums permit a full unobstructed opening, making emptying and cleaning exceedingly easy. Two devices are offered to effect tight closure of removable head—the new Toggle-tite quick-acting closure (cadmium plated) and the Bolt closure. They do not interfere with rolling or stacking container. The Hackney seamless barrel is drawn from a single plate of steel. There are no seams or joints to rust, spring or accumulate residue. At right—top—Hackney seamless bilged barrel with bolt closure. Right—Removable head welded type drum with I-bar hoops and new Toggle-tite closure that permits faster opening and closing.



## HACKNEY ACID DRUMS:

Top and bottom halves of Hackney two-piece acid drums pressed from circular sheets of steel and joined by one circumferential weld. No longitudinal or chime seams. Hoops held by means of lugs welded to wall of container. Surface inside and out free from pits, scale and uneven spots. For shipment of nitric and sulphuric acid. 110, 55, 30, 15-gallon capacity. Comply with I. C. C. 5A or 5C.

## HACKNEY BEER BARRELS:

For more than two years, Pressed Steel Tank Company have manufactured beer barrels for foreign use. Made to meet various requirements. Bilged or straight sided—insulated or non-insulated. Various coatings, linings, finished. Any standard tap or bung. Construction provides complete draining, easy and sure sterilization. Right—Bilged type, insulated. Outer shell strong—inner container smooth and free draining.



## HACKNEY AIR RECEIVER TANKS:

Pressed Steel Tank Company manufacture air receivers up to and including 20" diameter, and 60" length for working pressures up to 250 lbs. complying in every detail with A.S.M.E. Code and the Canadian Code. Cold drawing process and seamless construction results in extreme safety. Right—Tank for 150 lbs. working pressure under A.S.M.E. Code. Seamless shell with integral head. Left—For working pressure of 200 lbs. under Canadian Specifications.



Two seamless shells with integral head concave to pressure joined by approved weld at center.





# PROCTOR & SCHWARTZ, INC.

SEVENTH ST. AND TABOR ROAD, PHILADELPHIA, PA.

Cable Address: "PROCTOR", Philadelphia

## BRANCH OFFICES

CHICAGO, ILL. . . . . 154 Whiting Street  
CHARLOTTE, N. C. . . . . H. G. Mayer

PROVIDENCE, R. I. . . . . 422 Howard Building  
CANADA . . . W. J. Westaway Company, Ltd., Hamilton, Ont.

## PRODUCTS

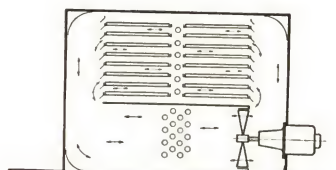
Driving Machinery for Chemical Products, Ceramics, Leather, Hair, Soap, Textiles, Hosiery, Fur, Tobacco, Paper Pulp, Pulp Board, Continuous Sheet, Strip or String Materials, Writing Paper, Veneer, Food Products and many other industrial materials.

## INVESTIGATION SERVICE

An Experimental Laboratory in charge of expert drying engineers is maintained to investigate the drying of any material and to recommend economical machinery for the purpose. Illustrated catalogs and pamphlets on request.

## PROCTOR DRYERS

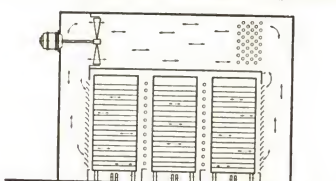
**Description:** Proctor Dryers are individually designed to meet the specific requirements of the material to be handled and the plant served. Briefly described, each machine consists of a scientifically insulated, fire-proof enclosure embodying the Proctor System of Air Recirculation, a source of



Cabinet Tray Dryer

heat supply, temperature and humidity controls, and a means of carrying the material dried.

**New Features:** Recently developed new types of Proctor Dryers embody radically improved construction features. . . super-

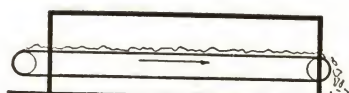


Truck System Dryer

insulated housing, preventing heat losses and saving steam; streamline interiors; direct-connected motor fan drives; automatically reversing air circulation; improved heaters, fans, conveyors, and other evidences of advanced skill of design and quality of construction throughout. Increased compactness, rigidity, freedom from operating troubles, cleanliness and accessibility are achieved, along with greater economy of operation.

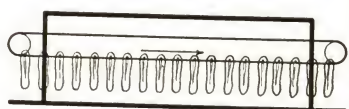
### A Dryer for Every Purpose:

Proctor Dryers are produced in a variety of types, both for batch and continuous drying. Types are distinguished by their individual methods of handling the material. Only a few types are shown, but these accurately reflect the ability of Proctor engineers to devise efficient ways of handling widely dissimilar materials as well as to provide correct and efficient drying treatment. Proctor conveyor systems also show a wide adaptability to processes other than drying, and for these purposes are sold separately.



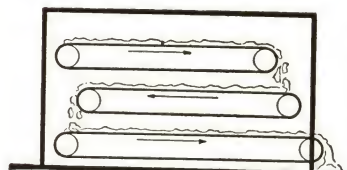
Single Apron Dryer

Types are distinguished by their individual methods of handling the material. Only a few types are shown, but these accurately reflect the ability of Proctor engineers to devise efficient ways of handling widely



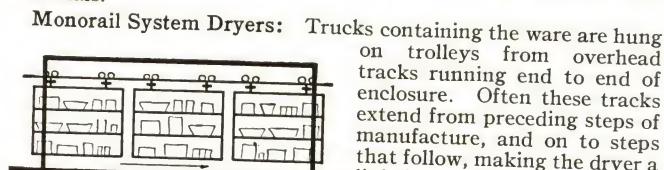
Continuous Skein Dryer

**Truck System Dryers:** The material is spread on trays or hung on poles, hooks, etc., and carried by trucks. Sizes to suit any number of trucks, for batch or progressive operation.



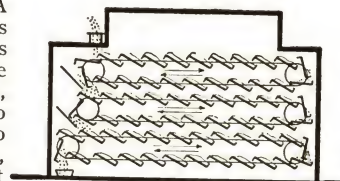
Multiple Apron Dryer

**Continuous Apron Dryers:** Fibrous or loose materials of many kinds are handled on continuous aprons. Single aprons or multiples of two, three or more aprons are used. These are produced in strong, sectional wire screen construction with or without traveling side guards, or in continuous lengths of suitable metal or fabric materials.



Monorail System Dryer

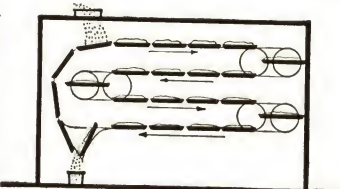
**Reversing Pan Dryers:** A series of unique pans or trays carry the material in runs back and forth through the dryer. At the ends of runs, the trays reverse position to dump their contents onto trays in the next lower run, until, at the end of the lowest run, the material is discharged into a hopper. The pans are set on an angle, giving compact arrangement and permitting efficient air circulation through the conveyor system. Repeated dumping of the material exposes fresh surfaces, speeding drying and promoting uniformity. For granular and loose materials, this system links with process steps which precede and follow it.



Reversing Pan Dryer

### Non-Tilting Pan Dryers:

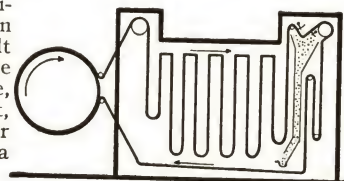
A continuous system of pans or trays which travel through the dryer in descending runs always in a horizontal position, thus the material remains undisturbed up to the point of discharge where the trays are tilted to dump the material into a hopper . . . a compact, efficient system.



Non-Tilting Pan Dryer

### Continuous Filter and Dryer:

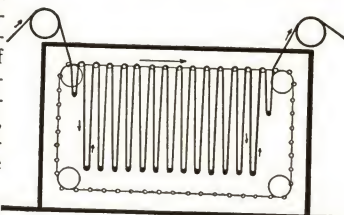
Filter combined most efficiently with drying through the transfer of the filter cake, direct from the filter drum, in the mesh of a continuous belt which is carried through the dryer in festoons. The cake, dried in the mesh of the belt, is released from the belt after drying and discharged into a chute.



Continuous Filter and Dryer

### Rolling Festoon Dryers:

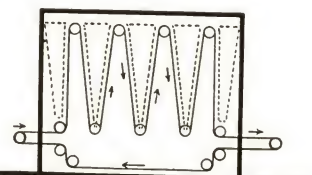
For tub-sized paper, built-up or treated fabrics and various sheet materials, this dryer carries the sheet in festoons over gear-driven supporting rolls which rotate and keep the material in motion over its supports so as to eliminate any marking that may result from sustained contact of material and support. Similar systems, with either rotating or stationary girt supports, are supplied for dyed and similarly processed textile piece goods and other fabrics.



Rolling Festoon Dryer

### Multipass Air-lay Dryer:

For continuous sheet, fabric, strip or string materials, variously processed . . . washed, dyed, impregnated, etc. Entirely new method of continuous conveying in which air serves both to dry material and help carry it. Material held out flat while dried at rapid rate . . . no tension . . . nothing touches upper face . . . no rollers . . . no loops to form . . . no guides to keep material straight . . . no leader necessary. Excels in ease of operation and space-saving compactness.



Multipass Air-Lay Dryer



# PULVERIZING MACHINERY CO.

ROSELLE PARK, N. J.

Cable Address: "MIKROPUL", Elizabeth, N. J.

DIRECT REPRESENTATIVES

NEW YORK    BOSTON    CHICAGO    CINCINNATI    DETROIT    SEATTLE    PHILADELPHIA    SAN FRANCISCO

## THE MIKRO-PULVERIZER

**Products Handled:** Large scale operation on bulk materials include Lime; Gums and other low melting point materials; Clays of all kinds, finest to coarsest, dry or moist; Kaolin for Fillers; Colors, Dyestuffs, Carbon Black, Oxides; Food Products, Wheat and Flour Mill By-Products, Spices; Miscellaneous Chemicals, Sulphur (reduced fire hazard); Sugar (at refineries, bakeries, chocolate plants, etc.); also Casein, Gypsum (raw and calcined), Fibrous Materials. Efficient for exceptionally thorough dispersion of Color, Flavor or Perfume in Kalsomine, Foods, Cosmetics (dry or wet).

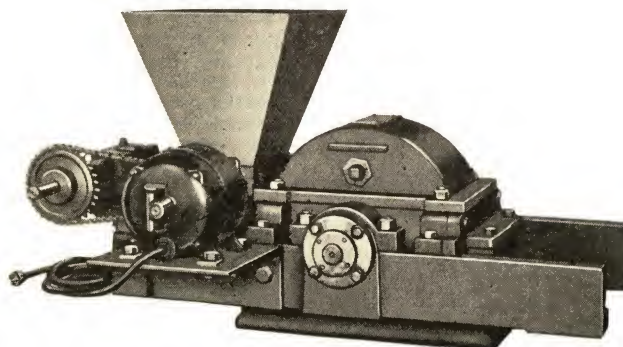
Special machines or modified MIKRO-PULVERIZERS, are furnished for most efficient wet grinding which reduce Dye Pastes, Inks, etc., in some cases to colloidal size, or as fine as heretofore possible by many passes through steel rolls or other devices.

**Description:** The Mikro-Pulverizer is a highly developed and perfected fine grinding unit. The U. S. Patent Office has broadly recognized this method of feed control, enabling us to generally eliminate fans, collectors, separators and other auxiliaries as usually employed. Equal and often finer results without the use of these auxiliaries such as 99.95% through 325 mesh are obtained. Our construction provides for feeding material through a hopper into feed screws which compact the material and convey it through closed channels direct against the hammers of the rotor. Hammers, rotor, feed screws, etc., are of various designs for different materials, based upon our extensive experience.

At bottom of the mill a tight fitting retaining screen, easily

removed, passes the uniformly pulverized material to a fabric or rigid chute to conveyors, bins, barrels or bags. The entire operation is relatively cool and absolutely dustless, minimizing fire hazards and other disadvantages. Practically no outside air passes through the mill unless desirable, in which case adjustable air inlets in the mill housing can be opened. When explosive materials are being handled explosion hazard can be entirely eliminated by passing inert gas or water through the air inlets in the mill housing.

The Mikro-Pulverizer is generally built to special specifications to suit each individual application. We are prepared to provide liners or castings and other necessary parts of stainless steel or non-ferrous alloys to resist corrosion, or abrasion resistant liners when required. Water or steam jackets can be applied.

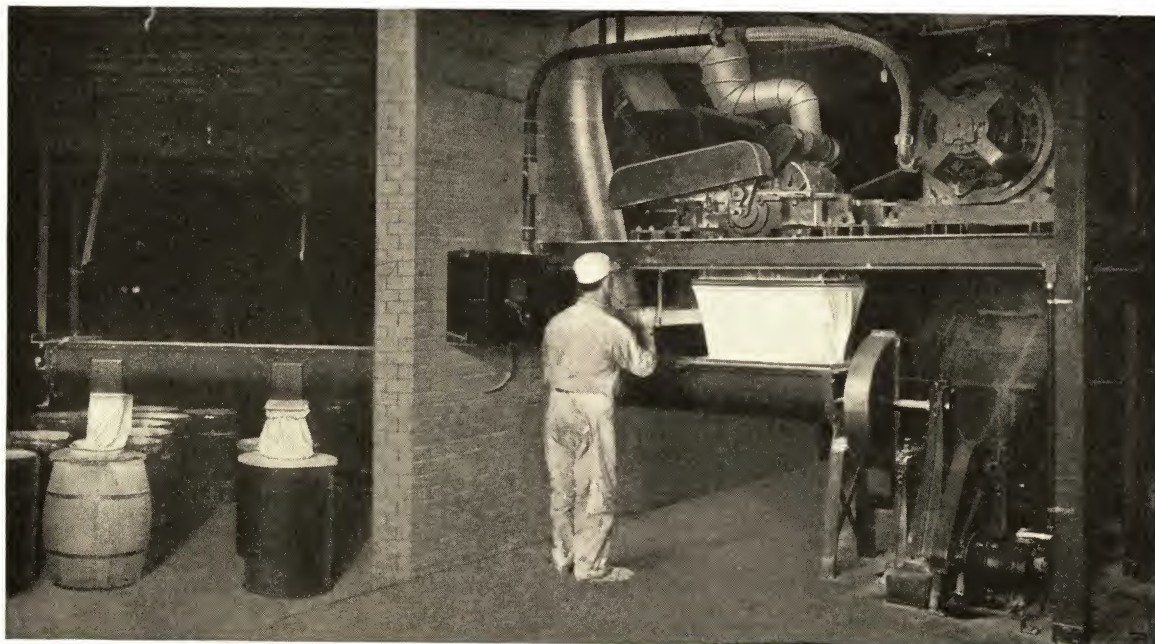


12-Inch Multiple Feed Screw MIKRO-PULVERIZER, with Fractional H. P. Motor Feed Drive. A Guard Fits Snugly Over Motor and Chain

### Summary of Important Advantages:

1. Substantial Savings, as High as 75%, in Horse-Power; also generally substantial saving in operative payroll.
2. Small Size and Heavy Duty.
3. Negligible Upkeep and Repairs in Years of Normal Service.
4. Absolutely Dustless.
5. Minimum Number of Parts, Easily Cleaned for Handling Different Materials.
6. Sold on Rigid Performance Guarantees.
7. Exceptional Laboratory Facilities for Experimental Grinding.

*Descriptive Catalog MC furnished on request.*



24-Inch Sugar MIKRO-PULVERIZER in Well-Known Chocolate Plant. Produces 4000 Lbs. per Hour Sugar 99.5% 100 Mesh with 40 H. P. with One Attendant. Formerly Used Five (5) Mills with Motors Aggregating 150 H. P. and Four (4) Attendants. A Saving of 3600 Sq. Ft. Floor Space Was Also Effectuated



# THE RELIANCE GAUGE COLUMN COMPANY

5914 CARNEGIE AVENUE, CLEVELAND, OHIO

*Low and High Water Level Alarms and Indicators for Boilers—Accessories*

## SERVICE

Reliance Engineers will assist with any boiler water level alarm problem.

# Reliance

TRADE MARK

## LITERATURE

Descriptive literature sent promptly on request.

## RELIANCE WATER COLUMNS AND ACCESSORIES

**Safety Water Column:** High or low alarms or combined high and low alarms.

Combined alarm (See Fig. 2) is for working pressures to 250 lbs. Hydraulically tested to 400 lbs. High grade castings, alarm valves of special nickel bronze with cone valve discs of chrome alloy steel—hardened, ground, lapped. Monel metal floats. Mechanism is simple, positive, frictionless, all above water.

Signal by whistle, electric alarm or both.

**Junior Water Column (Fig. 1):** For boilers where gages are tapped into boiler shell or section. Whistle signal for 15 lbs. pressure, will operate

low water. For 200 lbs. pressure, will operate as low as 5 lbs. Electric switch for pressures from 15 lbs. to vacuum, if desired.

**Forged Steel Columns for High Pressures:** For working pressures from 250 to 850 lbs. Joints made with metal gaskets. Valves have chrome alloy seats and discs, hardened and ground.

Monel metal floats. Flanged or screwed steam and water connections and water gages. 450 and 850-lb. (Fig. 3) columns hydraulically tested 50% above working pressures.

Every column given factory steam and water operation tests. Special columns for pressures to 2000 lbs.

### MONEL METAL FLOATS:

Monel floats made by fusion process, internal reinforcement, super-strong, non-porous, non-corroding, heat-proof, unsinkable in service. Highly buoyant, instant reaction to water levels. Tested at double working pressures.

### SMALL BOILER ALARM (Fig. 4):

Reliance Column No. 00 with Reliance Electric Alarm is made for heating and other boilers where pressure is between 50 lbs. and a vacuum. Float operates 110-volt 10-ampere or 220-volt 5-ampere mercury switch. Rings bell or operates buzzer, light or small motor. Tapped for 1/2-in. fittings. Whistle may be used instead of electric alarm. 1 in. steam and water connections.

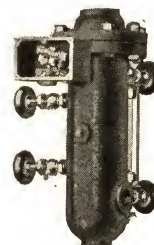


Fig. 4

### RELIANCE GAGE-LITE (Fig. 5):

Cast aluminum case, two-piece. Door acts as reflector. Face protected with clear 1/4-in. plate glass. Takes 50 or 60-watt lamp. Wide door for easy lamp replacement.



Fig. 5

### GAGE COCKS:

#### Standard:

For working pressures to 450 lbs. Renewable monel metal seats and chrome cone valves that screw in and out, for easy maintenance. Positive alignment. Body of heavy bronze, polished. Strong, non-corrosive stainless steel spring assures perfect valve operation.

Patented



Fig. 6

#### High Pressure:

For pressures to 2000 lbs. Heavy forged steel with chrome seats and discs.

Easily renewable without removing cock from column. Seats and discs made by special process giving remarkable resistance to steam and heat. Operated by two chains from floor. (Fig. 7.)

**Weighted:** For pressures to 250 lbs. Quick chain opening, weight closing. Position of weight easily adjusted. Renewable monel metal seat and copper disc. Body of high grade steam bronze. (Fig. 8.)

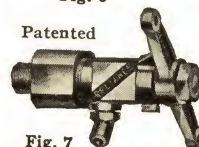


Fig. 7



Fig. 8

## RELIANCE WATER GAGES

**Chain Operated:** Of fine quality. Flanged or screwed connections. Vertical (Fig. 9) or inclined. Prismatic glass if desired. Built throughout of steam bronze for pressures to 650 lbs.; for pressures up to 2000 lbs. gages are made of heavy forged steel, with removable processed chrome seats and valves, and monel stems. Extra deep stuffing boxes. All have quarter turn, quick action, chain pull shut-off. Micasight inserts instead of glass, on order.



Fig. 9

**Micasight:** Elimination of glass breakage by use of mica securely bolted into special housing with enclosed, lighted reflector behind it. Clear visibility. Made in types



Micasight Pat. Pend. Fig. 10

for all pressures to 2000 lbs. and appropriate temperatures. Mica impervious to corrosive action of steam. Vertical or "Tiltview" patterns. Any tubular glass gage easily converted to Micasight by replacing glass with Micasight insert.



Fig. 11

### Inclined Water Gages: TILTVIEW:

Regular Reliance Water Gages fitted with screwed or flanged adaptors of standard or extra heavy pattern to match gages. Connections of high grade bronze. Top pipe connection of seamless steel tubing. Steel tie plate holds alignment.

**Prismatic Water Gage:** Shows black with water and silver with steam. Used in place of tubular glass for steam pressures not exceeding 450 lbs. Body of bronze, steel U-type bolts and malleable iron clamps. Multiple windows provide any length visibility required.

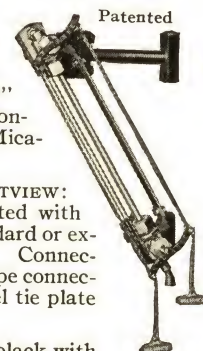


Fig. 12



# REPUBLIC FLOW METERS CO.

AND SMOOT ENGINEERING CORPORATION

2242 DIVERSEY PARKWAY, CHICAGO, ILL.

## BRANCH OFFICES

ATLANTA  
BOSTON  
CHICAGO

CINCINNATI  
CLEVELAND  
DALLAS

DENVER  
DETROIT  
GARY

INDIANAPOLIS  
KANSAS CITY

LOS ANGELES  
MINNEAPOLIS  
NEW YORK

PHILADELPHIA  
PITTSBURGH  
SALT LAKE CITY

SAN FRANCISCO  
SEATTLE  
ST. LOUIS

DOMINION FLOW METERS CO., TORONTO AND MONTREAL, CANADA

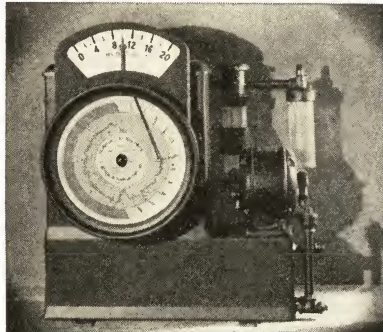
ELECTROFLO METERS CO., PARK ROYAL, LONDON, N. W. 10

## PRODUCTS:

Flow Meters for Steam, Water, Gas, Air and Oil; Boiler Meter Panels; CO<sub>2</sub> Recorders and Indicators; Draft Gages; Liquid Level Gages; Pressure Gages; Thermometers; Manometers; Orifices; Pitot Tubes; Pyrometers; Boiler Controls; Regulating Valves; Regulators; Desuperheaters; Steam Accumulators.

## CO<sub>2</sub> METERS:

The Republic Motor-Driven CO<sub>2</sub> Meter is available with either mechanical indicator and recorder, or with detached electrically operated reading instruments. It registers a continuous pen line record of percent CO<sub>2</sub> in flue gas, measured by the accurate and dependable Orsat method (volumetric absorption). Due to the fact that the Republic CO<sub>2</sub> Meter does not operate by water power, poor water conditions at points of installation need no consideration whatever. This instrument has been designed with a view to good appearance and visibility of record, as well as accuracy and ruggedness.

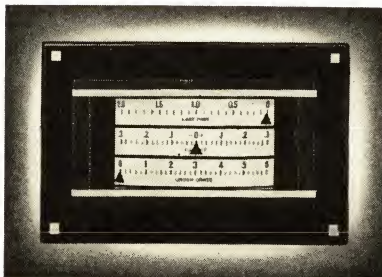


Republic Indicating and Recording CO<sub>2</sub> Meter

If desired, two additional records can be placed on the same ten inch circular chart. These records may be any combination of draft, temperature, or flow measurement.

## DRAFT GAGES:

Republic Draft Gages are actuated by an extremely simple diaphragm or bellows type mechanism, directly connected to a twelve inch pointer arm which travels horizontally across a fourteen inch illuminated scale. The scale with its large index figures, uniform graduations and internal illumination, can be easily read from a distance of fifty feet. The Republic Multiple Draft Gage is made up of a series of separate indicating units, and can be supplied in any combination and number of units desired. The entire instrument is housed in a dust-proof, compact, neat appearing case for either projected or flush mounting.



Republic Multi-Point Draft Gage



## FLOW METERS:

Republic Flow Meters are supplied for measuring the flow of steam, water, gas, air or oil. The reading instruments are electrically operated, which permits their being placed any distance from the point of flow measurement desired. These meters have proved themselves well adapted for long, accurate service in all types of industrial plants.

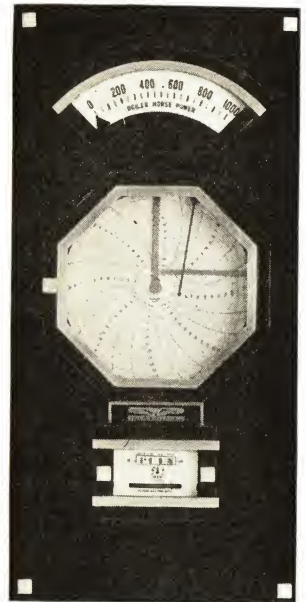
The reading instruments, indicator, recorder, and integrator are supplied separately, or in any combination desired. Each instrument is mounted on a 12 gauge steel panel 16 inches wide, and ranging in height from 16 inches to 32 inches, depending upon the instrument combination selected. Each actuating unit is individually housed and electrically shielded in a dust and moisture-proof metal container. The entire unit can be easily removed from the back of the panel for inspection.

In the majority of installations, the integrator readings are the most important of the three readings. For this reason the Republic integrator has been made the primary instrument, operating absolutely independent of the indicator or recorder. Its accuracy is not dependent on or affected by any clock mechanism or mechanical action. The cyclometer type dial is easily read and a special test dial is provided which permits accurate readings to be taken over a short period.

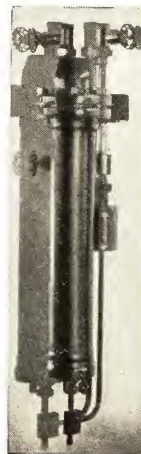
Separate indicators with a large 15 inch dial are also available for boiler front mounting.

The orifice plate is the standard differential medium used, although other types can be employed. The use of the thin plate orifice means low cost of installation. It can be inserted between any available flange where there is a reasonable amount of straight pipe.

The meter body or mercury "U" tube consists simply of the housing, the scale or resistance element, and mercury. As the mercury rises or falls in the "U" tube, due to changes in flow, it cuts in or out a definite amount of resistance, varying the current flowing through the



Indicator, Recorder, and Integrator



Meter Body



reading instruments in direct proportion to the flow in the pipe. The mercury is covered with oil which keeps the contact rods clean, and forms an oil seal, preventing foreign matter from entering the measuring chamber. Republic meters are designed for all ranges of differential pressures, and are available for the measurement of flow under pressures up to five thousand pounds per square inch.

## BOILER METER PANELS:

Republic Boiler Meter Panels are built to your specification with any combination of meter records desired. An outstanding feature is the Republic Multiple Strip Chart Recorder which records every essential boiler operation on one wide strip chart so that each record is separate and distinct, without the confusion of interwoven lines. A combination of any six records may be had on one chart regardless of whether they are records of temperature, CO<sub>2</sub> percentage, steam flow, or water flow.

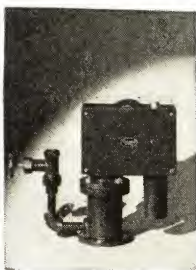
The boiler panel shown at the right has a multiple draft indicator, and the two integrating instruments necessary for the calculation and logging of results mounted along with the multiple strip chart recorder so that this panel affords a complete survey of boiler operation.

## MASTER PANELS:

Republic Master Panels, like the boiler meter panels, are built to your specification, with any combination of meter records desired.

## LIQUID LEVEL GAGES:

The Republic Liquid Level and Pressure Gage is of the electrical type, employing the Republic system or remote registration which permits the reading instruments to be located any distance from the place where the pressure or level record is taken. The reading instruments can be either indicating or recording, or both (as shown on panel.)



Gage Body

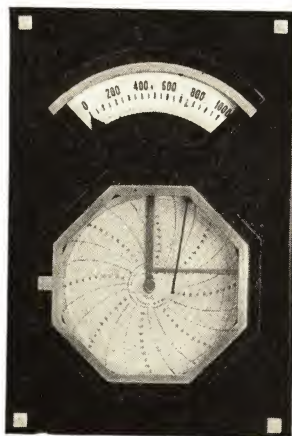
If desired, a large clock type indicator with a 15 inch dial can also be provided.

It is the function of this gage to measure static pressures, the pressure head, or height of liquids in pipes, tanks, standpipes, reservoirs,

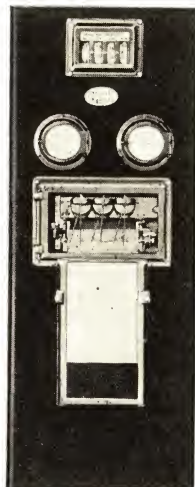
and numerous other applications.

The gage body or actuating medium consists of a metal bellows which receives the head or pressure. The travel of the bellows positions a wiper arm moving across a rheostat regulating the resistance in the instrument circuit so that the instruments indicate and/or record the varying head or pressure.

This gage can be easily adopted to a signal system or the automatic control of pumps or other equipment.



Level Indicator and Recorder



Boiler Meter Panel



## BOILER CONTROL:

Smoot Boiler Control is a centralized mechanical system for controlling steam pressure, combustion, furnace pressure, excess pressure, boiler level, etc. Can be furnished for all types and sizes of boilers as well as for all kinds of fuels and types of auxiliary equipment.

## REGULATORS:

Smoot Regulators are supplied for the control of pressure, volume, speed of rotation, liquid level and the proportioning of fluids. Smoot control of gas mixing provides an accurate proportioning of two or more gases over a wide variation of flow. Smoot regulation of coke oven plants is accepted as standard throughout the industry.

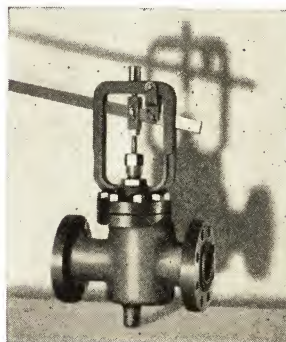


Smoot Regulator

## DESUPERHEATERS:

The Smoot Desuperheater is used with a pressure reducing valve for the reduction of steam temperatures. It is of the spray or contact type. The water flow is accurately controlled directly from the steam flow without the use of mechanical devices. It provides a thorough mixing of water with steam. This accurate control and thorough mixing results in a uniform outlet temperature.

## REGULATING VALVES:



Smoot Regulating Valve

Smoot Regulating Valves are designed for the regulation of pressure, level, speed and flow of liquids and gases. Can be supplied for manual, electrical or hydraulic operation. Smoot Regulating Valves are of turbine type design, guaranteeing long life and accurate regulation over the full range of flow under the most severe operating conditions.

## STEAM ACCUMULATORS:

Smoot Steam Accumulators and accumulator control systems are designed and built to meet your specific requirements for the storage of high and low pressure steam as well as the control of its distribution. They are recommended for processes having radically fluctuating loads and for balancing process steam demands against power requirements.



# RILEY STOKER CORPORATION

WORCESTER, MASS.

WORKS: WORCESTER, MASS., DETROIT, MICH., and CORNWELLS HEIGHTS, PA.

## BRANCH OFFICES

BOSTON, MASS.	NEW YORK, N. Y.	PHILADELPHIA, PA.	PITTSBURGH, PA.	BUFFALO, N. Y.	DENVER, COLO.
CLEVELAND, OHIO	CINCINNATI, OHIO	DETROIT, MICH.	CHICAGO, ILL.	ST. LOUIS, MO.	EL PASO, TEX.
KANSAS CITY, MO.	ATLANTA, GA.	SALT LAKE CITY, UTAH	NEW ORLEANS, LA.	ST. PAUL, MINN.	TACOMA, WASH.
INDIANAPOLIS, IND.	FT. WAYNE, IND.	HOUSTON, TEX.	SPOKANE, WASH.	LOS ANGELES, CAL.	BALTIMORE, MD.

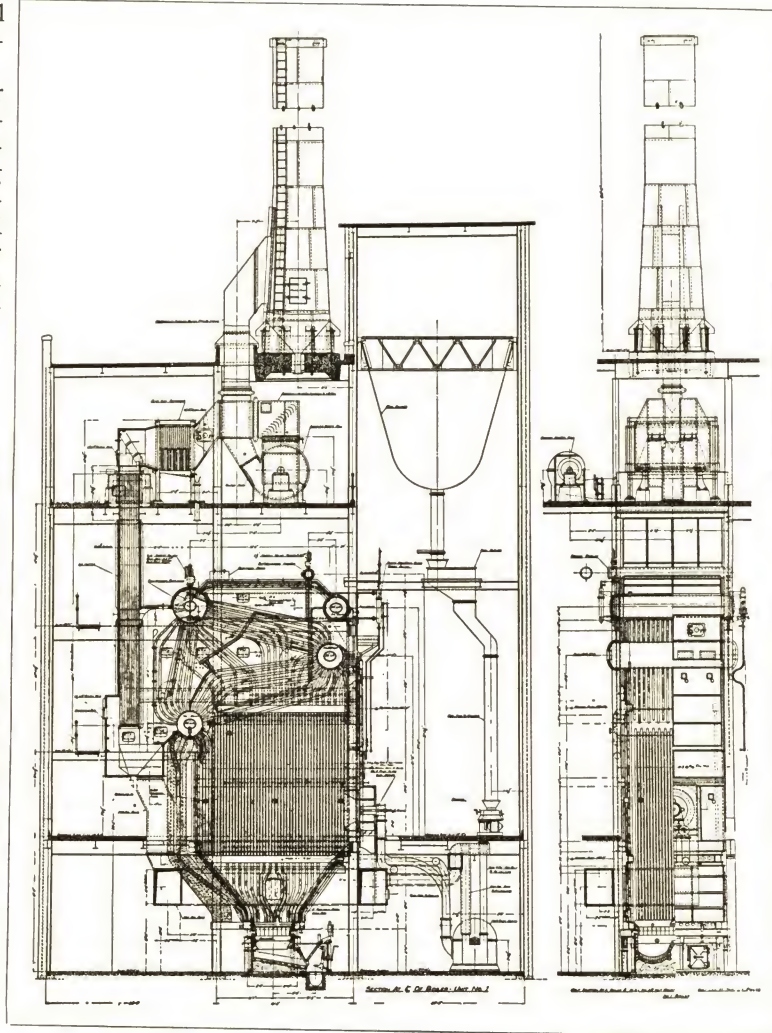
## PRODUCTS

Complete Steam Generating and Fuel Burning Equipment; Boilers; Superheaters; Water-cooled Furnaces; Air Preheaters; Economizers; Steel Clad Insulated Settings; Flue Gas Scrubbers; all types of Mechanical Stokers; Pulverized Coal Equipment; Pulverized Coal Burners.

The Riley Stoker Corporation is in a position to furnish complete steam generating and fuel burning equipment for any desired steam output under one contract without division of responsibility.

### RILEY BOILER

Riley Boilers (1) employ the principle of ring flow circulation, assuring positive rapid circulation at all boiler ratings. This results in low flue gas temperatures and high efficiency. These boilers are of the three or four drum bent tube type and are built for all boiler pressures and steam outputs. Their flexible design permits their installation under extreme space limitations. Send for *Catalog SW-109*.



Installation of Complete Steam Generating Units at Forstmann Woolen Co., Passaic, N. J.

### RILEY SUPERHEATERS

Riley Superheaters (2) are designed and manufactured as an integral part of the Riley Boiler. The superheater surfaces, because of the flexible design, may be installed in a number of different locations to give any desired steam temperature.

### RILEY WATER COOLED FURNACES

Riley Water Walls (3) are made up of straight tubes rolled at each end into rectangular seamless steel headers, connected with the boiler drums by bent tubes entirely within the setting limits. Bulky steam

and water circulation pipes outside the setting, with their bulky and expensive covering are not required. Rapid positive circulation is also a feature of Riley Water Walls. Maintenance is extremely low with this water wall. Send for *Catalog SW-110*.

### RILEY AIR PREHEATERS

Riley Air Preheaters (4) are of the tubular type of either single, two or three pass design. The design is extremely flexible, making possible a heater of the correct size for the amount of preheat desired. Send for *Catalog SW-112*.

### RILEY ECONOMIZERS

Riley Economizers are designed as an integral part of the boiler. These economizers are built in either single or two pass type, to give any desired amount of economizer surface. Send for *Catalog SW-113*.

### RILEY STEEL CLAD BOILER SETTINGS

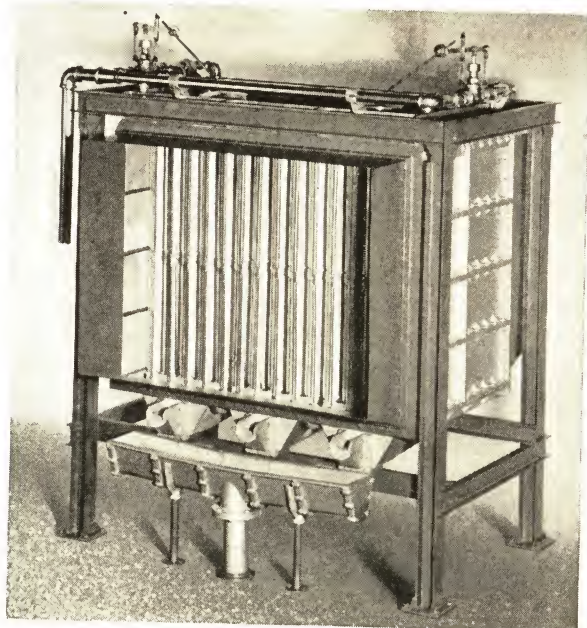
Riley Steel Clad Boiler Settings are ordinarily used with Riley Water Cooled Furnaces in which case refractory tile is placed next to the water wall tubes and is backed up with special insulating material and a sheet steel casing. Send for *Catalog SW-114*.

## A FEW USERS OF RILEY UNITS

Atwater Kent Mfg. Co., Philadelphia, Pa.	Lehigh Valley Coal Co., Wilkes-Barre, Pa.
Harnischfeger Corp., Milwaukee, Wis.	Hoskins Moranville Co., Menominee, Mich.
Northern Pacific Railway—3 plants	Sunbury Converting Works—2 plants
Aberfoyle Mfg. Co., Chester, Pa.	Forstmann Woolen Co., Passaic and Garfield, N. J.
Pennsylvania Sugar Co., Philadelphia, Pa.	Finch Pruyn & Co., Glens Falls, N. Y.
Columbia University, New York City	General Aniline Co., Grasselli, N. J.
Otter Tail Power Co.—3 plants	

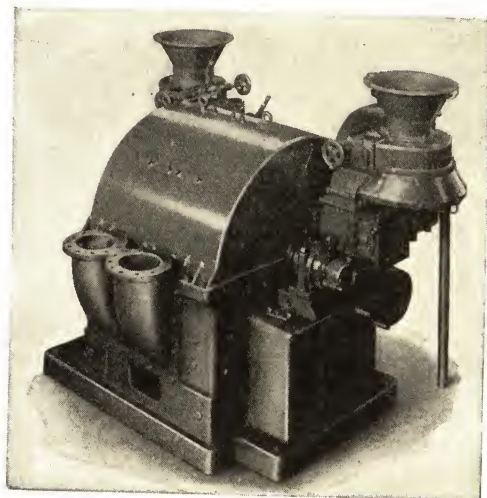


## RILEY STOKER CORPORATION



### RILEY FLUE GAS SCRUBBER

The Riley Flue Gas Scrubber is a device for eliminating dust particles from flue gases by a washing process. It may not only be installed in connection with steam generating boilers for the elimination of fly ash but can be applied to any dust eliminating problem where a wet process is permissible. Dust from blast furnaces, smelters, cement kilns, scratching rooms or various other industrial processes where excessive amounts of dust are produced, can be eliminated by this type of scrubber. Send for *Catalog SW-115*.



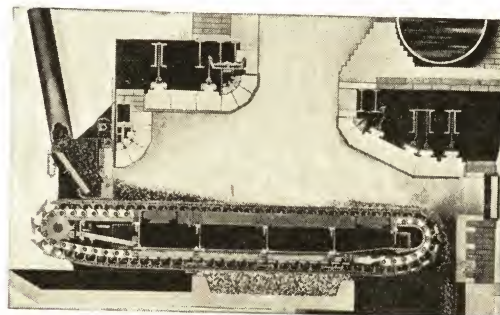
### RILEY ATRITA UNIT PULVERIZERS

Riley Atrita Unit Pulverizers are used in direct fired pulverized coal systems taking the raw coal from the bunker and discharging the pulverized coal direct to the burners. They are built in sizes having coal pulverizing capacities from 1500 pounds of coal per hour to 30,000 pounds of coal per hour. Send for *Catalog SW-92*.

### RILEY PULVERIZED COAL BURNERS

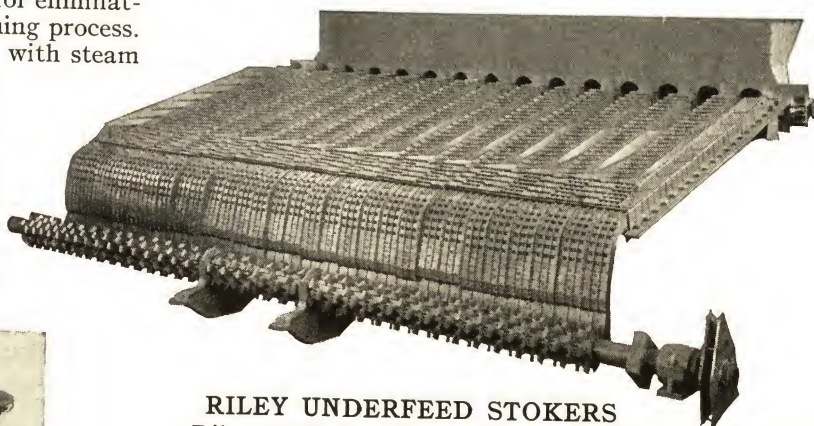
Riley Pulverized Coal Burners are designed to operate with maximum economy and to give stable ignition over wide load ranges. Burners are made in sizes to burn

as high as twelve thousand pounds of coal per hour and with a load operating range of from ten to one. Burners are all designed for short flame operation. Send for *Catalog SW-92*.



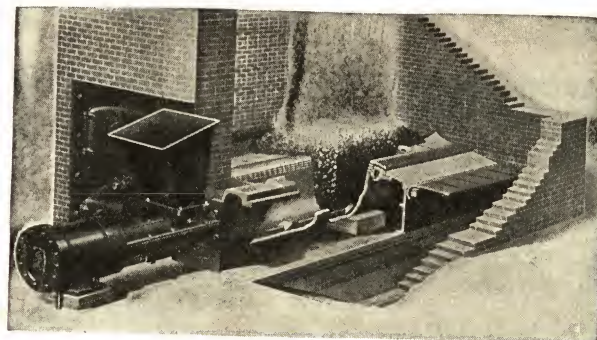
### HARRINGTON TRAVELING GRATE STOKERS

Harrington Stokers are of the forced draft traveling grate type which burn successfully and efficiently a wide range of fuels including all of the fine sizes of anthracite, lignite, mid-western coals, coke breeze, river dredgings and bituminous coals. They are built in sizes for installation under boilers from 200 hp. up to the largest built. Send for *Catalog SW-88*.



### RILEY UNDERFEED STOKERS

Riley Underfeed Stokers are multiple retort under feed stokers and may be equipped with either rocker dump or clinker grinder. They are particularly adapted for installation in plants where high capacities and efficiencies are desired. They are built in sizes suitable for installation under boilers from 200 hp. to the largest built. Send for *Catalog SW-115*.



### JONES SIDE DUMP STOKERS

Jones Side Dump Stokers are of the single or double retort type with dump plates at the sides. They are readily installed under existing boilers as but slight excavation is required. They are built in sizes for boilers from 50 hp. to 400 hp. They may be either steam or mechanically operated. Send for *Catalog SW-90*.



# REPUBLIC STEEL CORPORATION

GENERAL OFFICES AND TUBE WORKS  
YOUNGSTOWN, OHIO

## DISTRICT SALES OFFICES

BIRMINGHAM, ALA. . . . . Empire Bldg.  
BOSTON, MASS. . . . . Consolidated Bldg.  
BUFFALO, N. Y. . . . . Liberty Bank Bldg.  
CHICAGO, ILL. . . . . McCormick Bldg.  
CINCINNATI, OHIO . . . . . Carew Tower  
CLEVELAND, OHIO . . . . . Union Trust Bldg.  
DENVER, COLO. . . . . Continental Oil Bldg.  
DETROIT, MICH. . . . . Fisher Bldg.

GRAND RAPIDS, MICH., Grand Rapids Trust Bldg.  
HOUSTON, TEX. . . . . Gulf Bldg.  
INDIANAPOLIS, IND. . . . . Circle Tower  
LOS ANGELES, CAL. . . . . Edison Bldg.  
MILWAUKEE, WIS., First Wisconsin National Bank Bldg.  
NEW YORK, N. Y. . . . . Lincoln Bldg.  
PHILADELPHIA, PA., Fidelity Philadelphia Trust Bldg.

PITTSBURGH, PA. . . . . 4th & Bingham Sts.  
ST. LOUIS, MO. . . . . Paul Brown Bldg.  
ST. PAUL, MINN. . . . . First National Bank Bldg.  
SAN FRANCISCO, CAL. . . . . Rialto Bldg.  
SEATTLE, WASH. . . . . Smith Tower Bldg.  
TOLEDO, OHIO . . . . . Ohio Bank Bldg.  
TULSA, OKLA. . . . . 405 Thompson Bldg.  
YOUNGSTOWN, OHIO . . . . . Republic Bldg.

## PRODUCTS:

**PIPE:** Black and Galvanized Steel—Standard, Extra Strong and Double Extra Strong—Butt and Lap Welded; Line, Drive, Tubing, Casing and Rotary Drill Pipe; Toncan Copper Molybdenum Iron Pipe; Copper Bearing Steel Pipe; Electric Weld Line Pipe, Electric Weld Casing and Tubing, Grade C and D.

**STRIP:** Hot and Cold Rolled, Carbon, Alloy, Electrical, Toncan Iron and Enduro Stainless Steel.

**SHEETS:** Blue Annealed, Black Sheets in all finishes, Pickled, Full Finished, Auto Body, Metal Furniture, Electrical, Enameling, Galvanized, Galvannealed, Long Ternes; Formed Roofing and Siding Products; Toncan Iron; Enduro Stainless Steel.

**CULVERTS:** Toncan Iron Corrugated Culverts and Perforated Corrugated Drains.

**TUBING:** Round, Square, Rectangular, Hexagon, Helical, Oval and Ornamental Electric Welded Tubing in Steel, Toncan Iron and Enduro Stainless Steel.

**SPECIALTIES:** Toncan Iron Staybolts, Toncan Iron Firebox Plates, Toncan Iron Flue Sheets.

**UPSON DIVISION:** Bolts, Nuts, Rivets, Turnbuckles. DIE-ROLLED PRODUCTS.

TONCAN COPPER MOLYBDENUM IRON.

ENDURO STAINLESS STEELS.

AGATHON ALLOY STEELS.

## TONCAN COPPER MOLYBDENUM IRON PIPE:



Toncan Iron, the modern alloy of scientifically refined iron, copper and molybdenum, possesses a proved resistance to rust second among the ferrous metals only to the stainless irons and steels.

It is strong and ductile—works easily. Sizes  $\frac{1}{4}$ " to  $1\frac{1}{2}$ ", inclusive, are butt welded. Sizes 2" to 16" O.D. are electric resistance welded. Pipe is identified by a distinctive blue color and carries the name "Republic". Couplings are blue and stamped "RT". Write for a copy of "Pipe for Permanence."

## REPUBLIC ELECTRIC WELD LINE PIPE, CASING, TUBING:



Made of open hearth steel, special alloy steel and Toncan Iron by a patented process controlled exclusively by Republic Steel Corp. Perfectly round, of uniform wall thickness, clean, and with a weld stronger by test than

the wall. In sizes  $2\frac{3}{8}$ " to 16" O.D. Write for literature.

## REPUBLIC COPPER BEARING STEEL PIPE:

Suggested for installations comparable to atmospheric corrosive conditions. Pure copper added to the steel provides resistance to this type of corrosive attack. Works easily. Each length marked "Republic Copper Bearing Steel Pipe."



## REPUBLIC WROUGHT STEEL PIPE:

Made from uniformly good quality soft weldable steel, rolled from solid ingots. Butt or lap welded. Threads, flanges and bends easily. Marked with the name "Republic" in raised letters. Couplings stamped "RS".

## TONCAN COPPER MOLYBDENUM IRON SHEETS:

Made of rust-resisting Toncan Iron, these sheets provide an ideal material for roofing, siding, and other sheet metal uses where corrosive conditions would cause early failure in ordinary sheet metal.

Forming and working qualities are unsurpassed. Softer and more ductile than mild steel. In all gauges and sizes. Write for a copy of "The Path to Permanence."

## ENDURO STAINLESS STEELS:



This remarkable silvery metal is resistant to air, water and most acids at high and low temperatures. It is impervious to nitric acid in any concentration. Enduro resists corrosion, erosion, abrasion and oxidation. It is strong and ductile. The perfect metal for building decoration, food handling equipment, chemical equipment, high-temperature applications and many other uses. Made in a complete series of alloys. Submit your stainless problems to Republic Metallurgists.

## AGATHON ALLOY STEELS:



The lighter weight, greater strength and greater resistance to impact and torsional strain made possible by Agathon Alloy Steels are meeting the unusual demands of many industries. Investigate Agathon Alloy Steels.

## UPSON DIVISION PRODUCTS:



Bolts, nuts, rivets, turnbuckles and other headed and threaded specialties known for generations for quality of workmanship, dependability and uniformity. All standard and special shapes, sizes, alloys and finishes.

## DIE-ROLLED PRODUCTS:

Die-rolling answers the question of fast, economical production of duplicate parts formerly made by casting or forging. This process imparts great strength and rigidity, thus permitting smaller cross-sectional areas and resulting decrease in weight at lower cost. Production possibilities are unlimited. A trained engineering staff is at your disposal for adapting this process to your products.

## ENGINEERING SERVICE AND DETAILED INFORMATION:

Republic Engineers are always ready to make suggestions or offer assistance on any problem relating to the use of steel or steel products. Detailed information on any Republic product may be had from the General Offices or any District Sales Office.



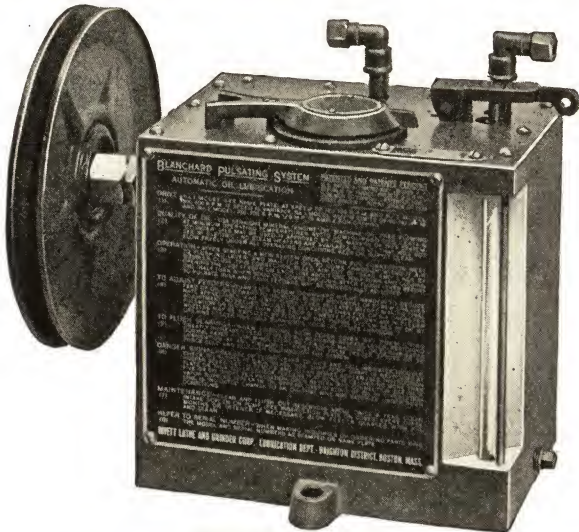
# RIVETT LATHE AND GRINDER CORP.

BRIGHTON, BOSTON, MASS., U.S.A.

## BLANCHARD PULSOLATOR

Automatic Oil Lubrication System  
for Industrial Machinery

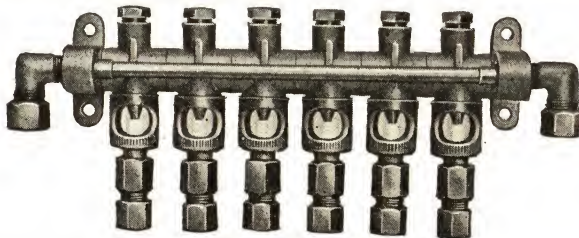
Driven from rotating member of machine or independent motor. Maintains constant low pressure circulation of oil through loop line with periodic quick impulses (pulsations) of high pressure to actuate feeders. Frequency of pulsations, from eight per minute to one every six minutes, determined by "model" of pumping unit selected—nine standard models.



Style 1 Pumping Unit

One pumping unit supplies up to one hundred feeders. Loop lines may be as long as one hundred feet. Double pump, with positive valves of piston type. Reservoir capacities, standard: 3 quarts, 4 quarts and 4 gals. Reservoirs of larger capacities and of special forms to suit particular application may be utilized. Styles 3 and 4 direct connected motor drive.

Double strainers to prevent dirt entering system. Oil level gage and non-detachable filler cover. Relief valve indicator constantly witnesses integrity of system and provides for instant flushing of all bearings at the Pumping Unit.



Gang of Feeders

Feeder valves actuated by pump pulsations. Upward flow of oil through seats prevents clogging. Individually adjustable from one drop an hour to a small stream per pulsation. Constantly maintain feed rates as adjusted. Vision of oil dropping to bearings through sight glasses. Single feeders of various body forms and multiple type arranged in gangs of two to twenty or more.

Blanchard Pulsolator automatically, reliably, and economically lubricates the bearings of industrial machinery. It starts and stops with the machine.

Conveniently installed on existing plant machinery. Already adopted by many leading machinery builders as original equipment.

## SUCCESSFULLY LUBRICATED BY PULSOLATOR

Assembly Machinery	Hydraulic Pumps
Automatic Chucking Machines	Metal Rolls
Automatic Screw Machines	Paper Mill Machinery
Bolt and Nut Machinery	Pipe Fittings Machinery
Boring Mills	Printing Presses
Coating Machinery	Punch Presses
Conveying Machinery	Refrigeration Machines
Cordage Machinery	Rubber Mill Machinery
Drilling Machinery	Sewing Machines
Food Manufacturing Machinery	Textile Machinery
Forging Machinery	Traveling Cranes
Glass Making Machinery	Wire Mill Machinery

Send for Bulletin B-5—Mention Type of Machinery to Be Lubricated.

# THE SAFETY GRINDING WHEEL & MACHINE CO.

2477 LARCH ST., SPRINGFIELD, OHIO

## PRODUCTS:

**Grinding Wheels:** "Rex" Wheels for metals of high tensile strength, "Corex" Wheels for metals of low tensile strength and "Safe-T-Bond" Wheels for high peripheral speeds—"A wheel for every purpose"—for 39 years.

**Grinding Machinery:** "Rite-Speed" Floor Grinders, Motor-driven Portable Grinders, Ball-bearing Floor Grinders (belt and motor driven), Swing Frame Grinders, Edge Grinders (Hand and Automatic Feed), Knife Grinders (belt and motor driven), Open-Side Surface Grinders, the SAFETY Collar System, and Sectional Wheel Chucks.



## SAFETY "RITE-SPEED" GRINDERS (Patented):

On these machines the speed change is automatically enforced even when using a constant speed motor. Any desired speed may be provided.

## SAFETY PORTABLE GRINDERS:

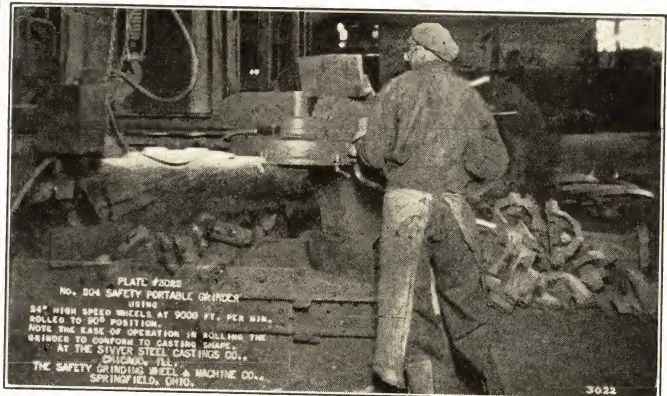
Made since 1911 with these outstanding features:—No gyroscopic action, full roll either direction, easy wheel change, perfect balance, and any desired operating speed.

## SAFETY GRINDING WHEELS:

A wheel for every purpose.

The SAFETY line is complete.

The "Perfec-Hole" wheel assures accurate running of the wheel.



**THE SAFETY PORTABLE GRINDER**  
SAFETY Originated the "Portable" Grinder. A Variety of Models are Available. They Provide a Full 90° Roll to Either Side and Are Perfectly Balanced. Adapted for High or Moderate Speed Wheels



# JOHN ROBERTSON CO., INC.

Established 1858  
(TUBAL CAIN IRON WORKS)

125 WATER ST., BROOKLYN, N. Y.

Manufacturers of Hydraulic Presses and Pumps

## PRODUCTS

EXTRUSION PRESSES for Lead Pipe, Lead Traps, Solder and Lead Wire, Non-ferrous Alloys, Graphite, Celluloid and other plastic materials, Electric Carbons and Carbon Electrodes.

LEAD ENCASING PRESSES for Electrical Cables and Rubber Hose.

PLATEN PRESSES for Embossing, Forming, Jewelers and Silversmiths.

HYDRAULIC PRESSURE PUMPS.

Filtering presses for Gums and Plastic Compounds.

HYDRAULIC ACCUMULATORS.



TRADE-MARK

## OVER 75 YEARS' EXPERIENCE

This company has specialized in the manufacture of soft metal extrusion machinery for over 70 years.

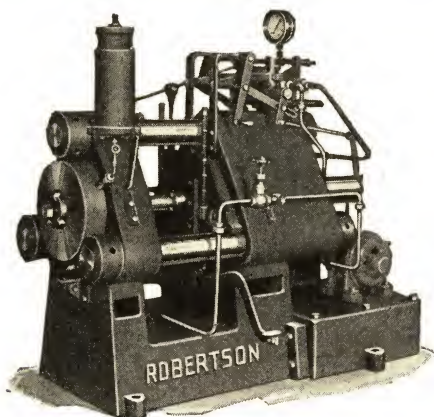
As designers and builders of hydraulic equipment for special requirements, we have complete designs and patterns of hydraulic presses available in capacities of 50 tons to 3000 tons.

*Robertson bulletins and descriptive literature sent on request.*

## METAL EXTRUSION PRESSES

We specialize in building vertical and horizontal metal extrusion presses for the extrusion of lead pipe, lead traps and bends, aluminum and bronze rods and other shapes of non-ferrous alloys. These presses range in hydraulic capacity from 250 tons to 3000 tons.

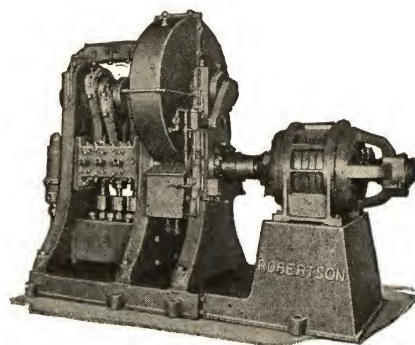
The illustration shows a 250-ton horizontal extrusion press for flux core solder wire, non-ferrous metal tubes of small diameter and miscellaneous shapes.



Horizontal Extrusion Press

## HYDRAULIC PRESSURE PUMPS

Power-driven hydraulic pressure pumps built for pressures from 2000 lbs. to 6000 lbs. per sq. inch and from 8 gals. to 100 gals. per minute. All shaft bearings bronze lined, except pinion shaft bearings, which are "Timken" roller. All pumps equipped with bronze bearings, automatic oiling, non-rust plungers, large capacity hydraulic safety relief valve, and herringbone gear-drive, fully enclosed in oil-tight case.



The Improved Robertson High Pressure Hydraulic Pump

## LEAD ENCASING PRESSES

These presses are used for extruding lead sheath directly on to electrical wires and cables from 1/4" to 5" outside diameter.

The illustration shows a Lead Cable Encasing Press of latest design and with complete equipment. Hydraulic capacity, 2500 tons. Similar presses equipped for the billet process are used in the rubber hose industry for placing a lead sheath on uncured rubber hose for vulcanizing purposes, the lead sheath being subsequently removed. Used also for lead encasing bare metal wires, rods and tubes for protective purposes. Built for hydraulic capacities from 650 tons to 2500 tons. Robertson Lead Encasing Presses used exclusively in many plants in the United States and abroad.

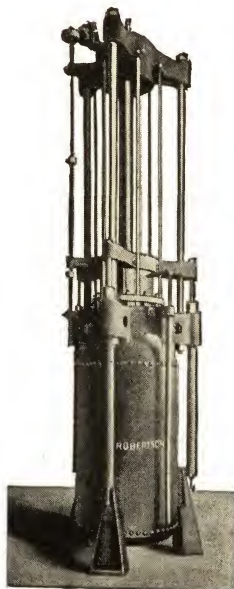


Lead Encasing Press

## HYDRO-PNEUMATIC ACCUMULATORS

Hydro-pneumatic Accumulators are built by us for pressures from 1500 lbs. to 6000 lbs. per sq. inch and in any capacity from 2 1/2 gals. to 96 gals. Air pressure at 175 lbs. per sq. inch is supplied from a small auxiliary air compressor for maintaining pressure in the air storage tank. The hydraulic cylinder is bronze bushed and the moving platen is fully guided to the three tie-rods. Limit switch and tell-tale rod provide for automatic pump control.

The minimum of floor space is required and an ordinary factory floor is sufficiently strong to support this equipment.



Hydro-Pneumatic Accumulator



# JOHN A. ROEBLING'S SONS COMPANY

MAIN OFFICE: TRENTON, N. J.

WORKS: TRENTON, N. J., ROEBLING, N. J.

NEW YORK, 107 Liberty Street—WAREHOUSES, 169-175 Hudson St.

CHICAGO . . . 205 West Wacker Drive  
PHILADELPHIA . . . 223 Arch St.  
CLEVELAND . . . 701 St. Clair Ave., N. E.

BOSTON . . . . . 51 Sleeper St.  
ATLANTA . . . . . 934 Avon Ave., S. W.  
SAN FRANCISCO . . . 624-646 Folsom St.

LOS ANGELES . . . 216 South Alameda St.  
PORTLAND, ORE., 1032 N. W. 14th Ave.  
SEATTLE . . . . . 900 First Ave., S.

*Manufacturers of Iron, Steel and Copper Wire Rope and Wire*

## ROEBLING WIRE ROPE:

We manufacture, and keep in stock at our works and branches, wire rope made from Iron, Cast Steel, Extra Strong Cast Steel, Plow Steel and "Blue Center" Steel.

We give below tables of strengths, etc., for the standard construction of Roebling "Blue Center" Steel Wire Rope. This Rope



"BLUE CENTER" STEEL HOISTING ROPE  
Reg. U. S. Pat. Off.

Composed of 6 Strands and a Hemp Center, 19 Wires to the Strand

List Price per Foot	Dia. in Inches	Approx. Circumference in Inches	Approx. Wt. per Foot in Pounds	Breaking Strength in Tons of 2000 Lbs.	Proper Working Load in Tons of 2000 Lbs.	Dia. of Drum or Sheave in Feet Advised
2.80	2 1/4	7 7/8	10	246	49	9.4
2.50	2 1/2	7 7/8	10	202	40	8.4
2.15	2 1/2	6 3/4	7.23	181	36.2	8.0
1.85	2	6 3/4	6.40	161	32	7.5
1.75	1 7/8	5 3/8	5.63	142	28	7.0
1.60	1 3/4	5 1/2	4.90	124	25	6.6
1.30	1 3/4	5 1/2	4.23	108	22	6.1
1.10	1 3/4	4 3/4	3.60	92.5	19	5.6
.90	1 3/4	4 3/8	3.03	78.5	16	5.2
.75	1 1/4	3 3/8	2.50	65	13	4.7
.62	1 1/4	3 1/2	2.03	53	10.6	4.2
.50	1	3 1/8	1.60	42	8.4	3.8
.39	7/8	2 3/4	1.23	32.2	6.4	3.3
.31	3/4	2 3/8	.90	23.7	4.7	2.8
.22 1/2	3/4	2	.63	16.6	3.3	2.3
.19	3/4	1 3/4	.51	13.5	2.7	2.1
.17	3/4	1 3/8	.40	10.8	2.16	1.9
.15 1/2	3/4	1 3/8	.31	8.4	1.68	1.7
.14 1/2	3/4	1 1/8	.23	6.3	1.26	1.4
.13 1/2	3/4	1	.16	4.5	.90	1.2
.13	3/4	3/4	.10	2.9	.58	1.0

is also supplied with 6 strands of 7 wires each and 8 strands of 19 wires each and 6 strands of 37 wires each.

Roebling "Blue Center" Steel Wire Rope is made from our highest strength steel of such physical qualities as to withstand exceptionally severe and unexpected stresses. Look for the Blue Hemp Center. Send for Catalog A-644.



"BLUE CENTER" EXTRA PLIABLE HOISTING ROPE  
Reg. U. S. Pat. Off.

Composed of 6 Strands and a Hemp Center, 37 Wires to the Strand

List Price per Foot	Dia. in Inches	Approx. Circumference in Inches	Approx. Wt. per Foot in Pounds	Breaking Strength in Tons of 2000 Lbs.	Proper Working Load in Tons of 2000 Lbs.	Dia. of Drum or Sheave in Feet Advised
3.75	2 3/4	8 5/8	11.72	285.0	57	6.2
3.15	2 3/4	7 7/8	9.69	237.0	47	5.6
2.75	2 1/2	7 7/8	7.85	194.0	39	5.1
2.40	2 1/2	6 3/4	7.00	174.0	34.8	4.8
2.10	2 1/2	6 3/4	6.20	155.0	31	4.5
1.90	1 7/8	5 3/8	5.45	137.0	27.4	4.2
1.75	1 3/4	5 1/2	4.75	119.5	24	3.9
1.45	1 3/4	5 1/2	4.09	103.3	21	3.7
1.25	1 1/2	4 3/4	3.49	88.2	18	3.4
1.05	1 1/2	4 3/8	2.93	74.3	15	3.1
.86	1 1/4	3 3/8	2.42	61.5	12	2.8
.75	1 1/4	3 1/2	1.96	49.9	10	2.5
.59	1	3 1/8	1.55	39.5	7.9	2.3
.46	7/4	2 3/4	1.19	30.5	6.1	2.0
.36	3/4	2 3/8	.87	22.8	4.6	1.7
.27	3/4	2	.61	16.1	3.2	1.4
.23	3/4	1 3/4	.49	13.2	2.6	1.3
.20	1/2	1 3/8	.39	10.6	2.12	1.1
.18 1/2	1/2	1 3/8	.30	8.3	1.66	.99
.17 1/2	1/2	1 1/8	.22	6.1	1.22	.84
.17	1/2	1	.16	4.4	.88	.71
.16 1/2	1/4	3/4	.10	2.8	.56	.57

## OTHER ROEBLING PRODUCTS

Roebling products, beside Wire Rope, are Wire Rope Fittings, Hooks, Clips, Sockets, etc., Wire Rope Slings, Wire Strand, Telephone Wire, Flat Wire, Trolley Wire, Welding Wire, Special Wires, Electrical Wires and Cables, Wire Cloth, Wire Netting, Wire Screens.

Roebling Wire Rope Slings are the safe, practical and efficient means of handling heavy loads in and about the shop, and structural steel in the erection of large buildings. They are made of our strongest steel, Roebling "Blue Center" and, wherever possible,

forgings in tension have been eliminated. Many of the slings are fitted with equalizing thimbles which allow an even distribution of the load hoisted. We issue a large wire rope sling catalog No. A-679 which we will be glad to send on application.

Roebling Electrodes can be used with all makes of electric welding equipment. Standard stock sizes are: 1/4", 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1 1/8", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/2", 3", 3 1/2", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 24", 28", 32", 36", 40", 48", 60", 72", 84", 96", 108", 120", 144", 168", 192", 216", 240", 264", 288", 312", 336", 360", 384", 408", 432", 456", 480", 504", 528", 552", 576", 600", 624", 648", 672", 696", 720", 744", 768", 792", 816", 840", 864", 888", 912", 936", 960", 984", 1008", 1032", 1056", 1080", 1104", 1128", 1152", 1176", 1200", 1224", 1248", 1272", 1296", 1320", 1344", 1368", 1392", 1416", 1440", 1464", 1488", 1512", 1536", 1560", 1584", 1608", 1632", 1656", 1680", 1704", 1728", 1752", 1776", 1800", 1824", 1848", 1872", 1896", 1920", 1944", 1968", 1992", 2016", 2040", 2064", 2088", 2112", 2136", 2160", 2184", 2208", 2232", 2256", 2280", 2304", 2328", 2352", 2376", 2400", 2424", 2448", 2472", 2496", 2520", 2544", 2568", 2592", 2616", 2640", 2664", 2688", 2712", 2736", 2760", 2784", 2808", 2832", 2856", 2880", 2904", 2928", 2952", 2976", 3000", 3024", 3048", 3072", 3096", 3120", 3144", 3168", 3192", 3216", 3240", 3264", 3288", 3312", 3336", 3360", 3384", 3408", 3432", 3456", 3480", 3504", 3528", 3552", 3576", 3600", 3624", 3648", 3672", 3696", 3720", 3744", 3768", 3792", 3816", 3840", 3864", 3888", 3912", 3936", 3960", 3984", 4008", 4032", 4056", 4080", 4104", 4128", 4152", 4176", 4200", 4224", 4248", 4272", 4296", 4320, 4344, 4368, 4392, 4416, 4440, 4464, 4488, 4512, 4536, 4560, 4584, 4608, 4632, 4656, 4680, 4704, 4728, 4752, 4776, 4800, 4824, 4848, 4872, 4896, 4920, 4944, 4968, 4992, 5016, 5040, 5064, 5088, 5112, 5136, 5160, 5184, 5208, 5232, 5256, 5280, 5304, 5328, 5352, 5376, 5400, 5424, 5448, 5472, 5496, 5520, 5544, 5568, 5592, 5616, 5640, 5664, 5688, 5712, 5736, 5760, 5784, 5808, 5832, 5856, 5880, 5904, 5928, 5952, 5976, 6000, 6024, 6048, 6072, 6096, 6120, 6144, 6168, 6192, 6216, 6240, 6264, 6288, 6312, 6336, 6360, 6384, 6408, 6432, 6456, 6480, 6504, 6528, 6552, 6576, 6600, 6624, 6648, 6672, 6696, 6720, 6744, 6768, 6792, 6816, 6840, 6864, 6888, 6912, 6936, 6960, 6984, 7008, 7032, 7056, 7080, 7104, 7128, 7152, 7176, 7200, 7224, 7248, 7272, 7296, 7320, 7344, 7368, 7392, 7416, 7440, 7464, 7488, 7512, 7536, 7560, 7584, 7608, 7632, 7656, 7680, 7704, 7728, 7752, 7776, 7800, 7824, 7848, 7872, 7896, 7920, 7944, 7968, 7992, 8016, 8040, 8064, 8088, 8112, 8136, 8160, 8184, 8208, 8232, 8256, 8280, 8304, 8328, 8352, 8376, 8400, 8424, 8448, 8472, 8496, 8520, 8544, 8568, 8592, 8616, 8640, 8664, 8688, 8712, 8736, 8760, 8784, 8808, 8832, 8856, 8880, 8904, 8928, 8952, 8976, 9000, 9024, 9048, 9072, 9096, 9120, 9144, 9168, 9192, 9216, 9240, 9264, 9288, 9312, 9336, 9360, 9384, 9408, 9432, 9456, 9480, 9504, 9528, 9552, 9576, 9600, 9624, 9648, 9672, 9696, 9720, 9744, 9768, 9792, 9816, 9840, 9864, 9888, 9912, 9936, 9960, 9984, 10000.

order. Standard length is 14", in burlapped bundles of 50 lbs. each. Roebling Electrodes analyze Carbon, 0.13% to 0.18%; Manganese 0.40% to 0.60%; Sulphur, Phosphorus and Silicon, negligible. Special analyses are furnished on special orders.

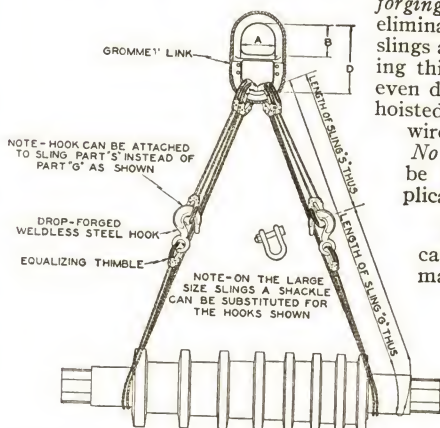
Roebling Gas Welding Wire is copper coated to distinguish it easily from Roebling Electrodes. It is supplied in standard sizes: 3/8", 1/2", 5/8", 3/4", 7/8", 1", 1 1/8", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/2", 3", 3 1/2", 4", 5", 6", 8", 10", 12", 14", 16", 18", 20", 24", 28", 32", 36", 40", 48", 60", 72", 84", 96", 108", 120", 144", 168", 192", 216", 240", 264", 288", 312", 336", 360", 384", 408", 432", 456", 480", 504", 528", 552", 576", 600", 624", 648", 672", 696", 720", 744", 768", 792", 816", 840", 864", 888", 912", 936", 960", 984", 1008, 1032, 1056, 1080, 1104, 1128, 1152, 1176, 1200, 1224, 1248, 1272, 1296, 1320, 1344, 1368, 1392, 1416, 1440, 1464, 1488, 1512, 1536, 1560, 1584, 1608, 1632, 1656, 1680, 1704, 1728, 1752, 1776, 1800, 1824, 1848, 1872, 1896, 1920, 1944, 1968, 1992, 2016, 2040, 2064, 2088, 2112, 2136, 2160, 2184, 2208, 2232, 2256, 2280, 2304, 2328, 2352, 2376, 2400, 2424, 2448, 2472, 2496, 2520, 2544, 2568, 2592, 2616, 2640, 2664, 2688, 2712, 2736, 2760, 2784, 2808, 2832, 2856, 2880, 2904, 2928, 2952, 2976, 3000, 3024, 3048, 3072, 3096, 3120, 3144, 3168, 3192, 3216, 3240, 3264, 3288, 3312, 3336, 3360, 3384, 3408, 3432, 3456, 3480, 3504, 3528, 3552, 3576, 3600, 3624, 3648, 3672, 3696, 3720, 3744, 3768, 3792, 3816, 3840, 3864, 3888, 3912, 3936, 3960, 3984, 4008, 4032, 4056, 4080, 4104, 4128, 4152, 4176, 4200, 4224, 4248, 4272, 4296, 4320, 4344, 4368, 4392, 4416, 4440, 4464, 4488, 4512, 4536, 4560, 4584, 4608, 4632, 4656, 4680, 4704, 4728, 4752, 4776, 4800, 4824, 4848, 4872, 4896, 4920, 4944, 4968, 4992, 5016, 5040, 5064, 5088, 5112, 5136, 5160, 5184, 5208, 5232, 5256, 5280, 5304, 5328, 5352, 5376, 5400, 5424, 5448, 5472, 5496, 5520, 5544, 5568, 5592, 5616, 5640, 5664, 5688, 5712, 5736, 5760, 5784, 5808, 5832, 5856, 5880, 5904, 5928, 5952, 5976, 6000, 6024, 6048, 6072, 6096, 6120, 6144, 6168, 6192, 6216, 6240, 6264, 6288, 6312, 6336, 6360, 6384, 6408, 6432, 6456, 6480, 6504, 6528, 6552, 6576, 6600, 6624, 6648, 6672, 6696, 6720, 6744, 6768, 6792, 6816, 6840, 6864, 6888, 6912, 6936, 6960, 6984, 7008, 7032, 7056, 7080, 7104, 7128, 7152, 7176, 7200, 7224, 7248, 7272, 7296, 7320, 7344, 7368, 7392, 7416, 7440, 7464, 7488, 7512, 7536, 7560, 7584, 7608, 7632, 7656, 7680, 7704, 7728, 7752, 7776, 7800, 7824, 7848, 7872, 7896, 7920, 7944, 7968, 7992, 8016, 8040, 8064, 8088, 8112, 8136, 8160, 8184, 8208, 8232, 8256, 8280, 8304, 8328, 8352, 8376, 8400, 8424, 8448, 8472, 8496, 8520, 8544, 8568, 8592, 8616, 8640, 8664, 8688, 8712, 8736, 8760, 8784, 8808, 8832, 8856, 8880, 8904, 8928, 8952, 8976, 9000, 9024, 9048, 9072, 9096, 9120, 9144, 9168, 9192, 9216, 9240, 9264, 9288, 9312, 9336, 9360, 9384, 9408, 9432, 9456, 9480, 9504, 9528, 9552, 9576, 9600, 9624, 9648, 9672, 9696, 9720, 9744, 9768, 9792, 9816, 9840, 9864, 9888, 9912, 9936, 9960, 9984, 10000.



ROEBLING WELDING WIRE

Size in Inches	Approximate Weight per 100 Pieces, in Lbs.		Pieces per 100 Lbs.		Pieces per Bundle of 50 Lbs. Each	
	14"	36"	14"	36"	14"	36"
1/2	77.79	200.04	129	50	64	25
3/8	59.56	153.15	168	65	84	33
5/8	43.76	112.52	229	89	114	44
3/4	30.38	78.14	329	128	165	64
7/8	19.45	50.01	515	200	258	100
1	10.94	28.13	914	355	457	178
1 1/8	7.597	19.53	1318	512	659	256
1 1/4	4.862	12.502	2058	800	1029	400
1 1/2	2.735	7.032	3656	1422	1828	711
1 3/4	1.215	3.126	8264	3205	4132	1603
2	0.3039	0.7815	32894	12820	16447	6410

Weight of Steel at 0.283 lb. per cubic inch.





# ROOTS-CONNSVILLE BLOWER CORP.

16TH ST. AND COLUMBIA AVE., CONNSVILLE, INDIANA

## SALES OFFICES

NEW YORK CHICAGO POTTSTOWN, PA. BOSTON PITTSBURGH DETROIT ST. LOUIS SAN FRANCISCO LOS ANGELES

### PRINCIPAL PRODUCTS

**Rotary Blowers and Gas Pumps** for moving air or gas under pressure or vacuum. Blowers for combustion, agitation, aeration, pneumatic conveying, etc. Gas Pumps for gas and chemical plants, oil refineries, etc.

**Centrifugal Blowers and Gas Pumps** suitable for a wide range of pressure and vacuum services.

**Rotary Vacuum and Liquid Pumps** for paper mill suction rolls, filtration service, viscous liquids, etc.

**Centrifugal Pumps**, including non-clogging types, built in many sizes, for all standard types of drives.

**Turbine Pumps** suitable for handling water, brine, light oils, etc., in small quantities, at high heads.

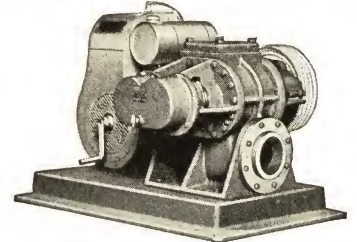
**Rotary Displacement Meters** for accurately measuring air or gas in larger volumes. Low differential.

**Miscellaneous:** Inert Gas Producers, Superchargers, Portable Vacuum and Blowing Units, Blast Gates, etc.



### ROTARY VACUUM AND LIQUID PUMPS

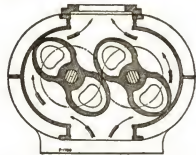
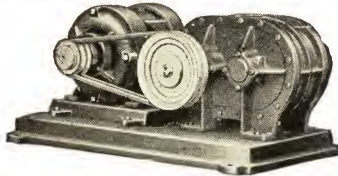
For handling heavier viscous liquids in quantities of 10 gals. per minute, and larger, at heads up to 150 ft., or for producing vacuums up to 26 in. Hg, handling air and liquids simultaneously. Simplicity of design and sturdiness of construction are features. No valves, springs, or buckets. Motion is rotary without reversals, giving large capacities. Type "R" pump illustrated is V-belted to gasoline engine, but all other standard driving arrangements are also available. Low power consumption and freedom from maintenance expense are features of these Rotary Pumps, for heavy duty vacuum and liquid service.



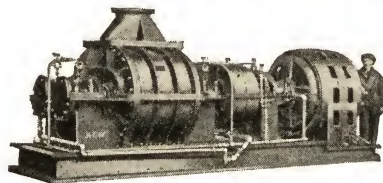
### ROTARY BLOWERS AND GAS PUMPS

**Blowers:** Built in many sizes and styles for capacities of 5 to 50,000 cu. ft. per minute at pressures ranging up to 15 lbs. per sq. in. in single-stage units, and up to 30 lbs. per sq. in. in the compound arrangement.

**Characteristics:** A known volume of air definitely displaced each revolution of the impellers (see diagram below); high efficiencies; low power cost per cubic foot of air handled; clean air because of no internal seal or lubricant. These characteristics are valuable in many industrial processes, including combustion, pneumatic conveying, agitation and aeration, forced ventilation, etc. Illustration above is typical of smaller size Blowers and Gas Pumps. In addition to V-belt drive shown, these units are also available in single pulley or direct-coupled driving arrangements. Antifriction or sleeve bearings. Heat-treated steel gears available for heavy service.

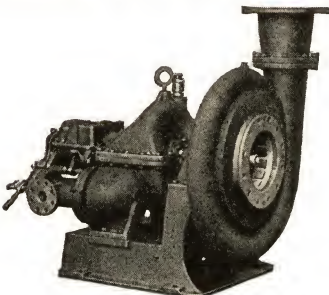


**Gas Pumps, Exhausters or Boosters**, are constructed in same general range of capacities and pressures as the Blowers, but with special features adapting them to handling gases and vapors. Patented stuffing boxes, reinforced head plates, correct ribbing, and split case construction, are some features which increase the serviceability of these modern Gas Pumps. Illustrated in cut above is a large unit direct-coupled to motor. Larger units, both Blowers and Gas Pumps, are available with many types of drive, including motor, steam engine, V-belt, etc.

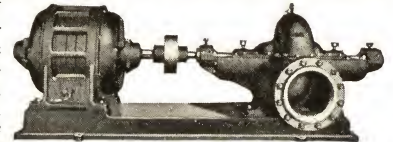


### CENTRIFUGAL BLOWERS AND GAS PUMPS

Centrifugal Blowers, Exhausters, and Compressors, for air or gas, are built for capacities up to 30,000 cu. ft. per minute at pressures up to 10 lbs. Available in side inlet or double suction types, and in single and multi-stage units. Built for direct connection to motor or steam turbine; and in smaller sizes, with impeller mounted direct on extended motor shaft. These Blowers can be furnished in special alloys to resist corrosion or abrasion, as may be required in any specified application. The long experience of this organization, specializing in equipment for handling air and gas, coupled with unusual facilities for building and testing such units, assures a product that offers maximum service and efficiency under all conditions.

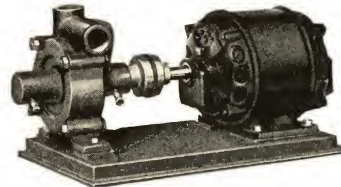


**"R-C" Centrifugal Pumps**, including non-clogging types, are built in sizes ranging from 40 to 20,000 gallons per minute, and for pressures up to 1500 lbs. per sq. in. Impellers of correct hydraulic design, eliminating end thrust and balancing devices, can be made of special alloys for handling corrosive or abrasive liquids. Economy and reliability of these pumps are based on designs perfected during 22 years of active experience in building centrifugal units. Pump shown above is a Type "A" double suction, single stage unit.



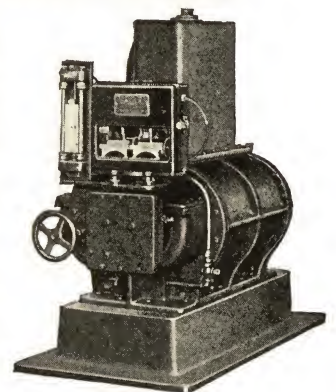
### TURBINE PUMPS

Operating characteristics are such it is only necessary to select a pump for maximum head, instead of calculating the head closely. Suitable for handling water, brine, light oils, chemicals, and numerous other liquids, in volumes of 3 to 300 gals. per minute at heads of 350 ft. and higher. Simple design, sturdy construction, compact size, and light weight are some of the other features of this modern pump. Ability to handle high heads, without multi-staging, is a great advantage.



### ROTARY DISPLACEMENT METERS

Dependable accuracy is combined with low installation and maintenance cost, small space requirements, and practically no operating expense. Sturdy cast iron construction. Illustrated herewith is one of the smaller size Meters, fitted with base volume index which particularly adapts it to application in many industrial services. Low-pressure types range up to a maximum peak line pressure of 25 lbs., while the high-pressure types range up to 75 lbs. Special arrangements can be provided for pressures up to 300 lbs.



### LITERATURE ON REQUEST

Descriptive matter covering all types of equipment listed above will be forwarded promptly upon request.



# RUGGLES-KLINGEMANN MFG. CO.

SALEM, MASS.

*Manufacturers of a Complete Line of Regulating Devices*

## PRODUCTS

**Regulators:** Boiler Steam Pressure, Overfire Draft, Stoker and Blower Control. Regulators for reducing steam pressure and for the control of temperature.

**Valves:** Reducing Pressure, Boiler Stop and Check, Back Pressure, Turbine Bleeder Check, Relief for extraction lines, Motor, Solenoid or Thruster Operated, Straightway, Three and Four-way and Solenoid Trip.



## REGULATORS

**Fig. 25-B R-K "Step Action" Regulators:** Eliminate over correction and hunting action. Variable boiler loads are controlled through step action regulators, as the nearest approach to economies obtainable under base load conditions.

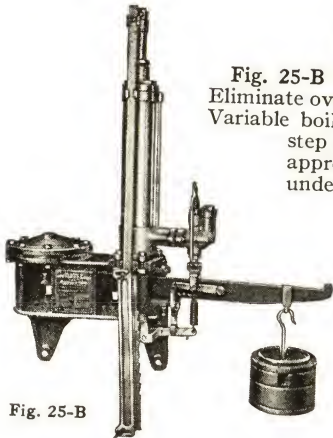


Fig. 25-B

**Fig. 33 R-K "Step Action" Temperature Regulators:** Provide powerful operating means for the control of large size balanced lever valves for supplying steam to storage or instantaneous types of hot water heaters.

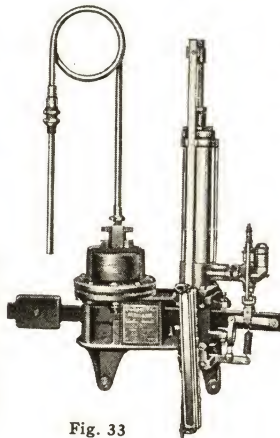


Fig. 33

**Fig. 261 Combined Solenoid Trip and Hand Throttle Valve:** Positive in action, tight seating, available in sizes  $2\frac{1}{2}$  to 6 ins. for any pressure or temperature.

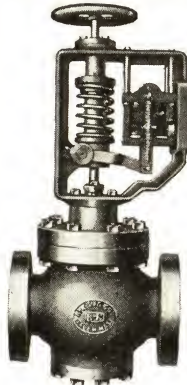


Fig. 261

water control is required. Cast iron body, composition interiors, or cast steel body with stainless steel interiors. Made in sizes from 1 to 4 ins., inclusive.

**Fig. 111 Electro-temp Controller:** A combination reducing valve and temperature limit controller. Will maintain average temperature of water within 2 to 5 degrees. Suitable for 110 or 220 volts, 60 cycle, 3 phase. Control circuit may be single phase. Adaptable wherever hot

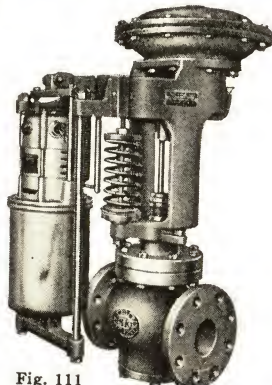


Fig. 111

**Fig. 95 Unloading Valve:** A low pressure reducing or unloading valve, extremely sensitive and capable of handling exceptionally large capacities with little variation of pressure. As illustrated, suitable for relief or reduced pressures up to 5 lbs. May be fitted with pilot control for higher pressures.

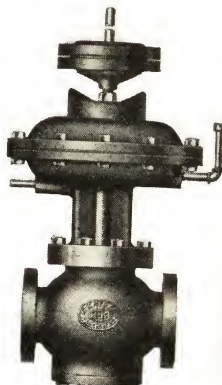


Fig. 95

**Fig. 229-A Trip Valve:** For automatically opening or closing pipe lines upon either application of current, or loss of current. Positive in closing, manual lever set. Sizes  $\frac{1}{2}$  to 2 ins., inclusive, for pressures up to 150 lbs. Valves of similar design but of more rugged construction for higher pressures in sizes from 1 to 12 ins., inc., are available.

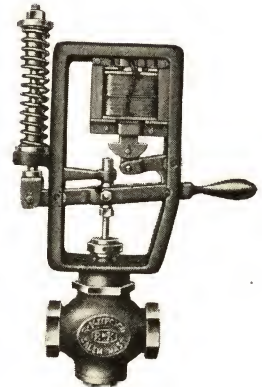


Fig. 229-A

**Fig. 246 Motor Operated Valves:** Of rugged construction in either cast iron or cast steel as conditions require.

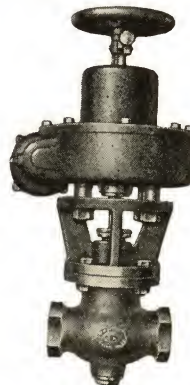


Fig. 246

Embody novel features which permit positive seating and unseating of valve without overloading the electric motor. Made in sizes 1 to 3 ins. of design shown. In similar design with some modifications in larger sizes up to 24 ins.

**Fig. 144-B Four-way Valves:** For operation of double acting cylinders, power stroke in both directions.

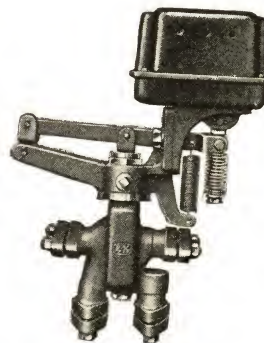


Fig. 144-B

**Fig. 143-B Three-way Valves (not shown):** For operation of single acting cylinders where return of cylinder is by another force.

Both types can be arranged with double solenoids to remain in either position without continuous current application, or to return to neutral for positioning cylinders. For air, water, or oil. Not recommended for steam. Both types are made in all bronze, in sizes  $\frac{3}{8}$  to 2 ins., inclusive.

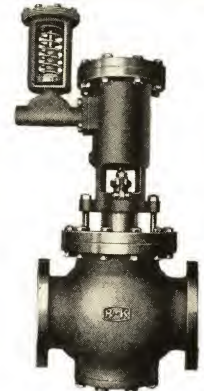


Fig. 258

**Fig. 233-A Swing Check Valve:** Used for preventing the back flow of steam. Particularly adaptable for installation in extraction lines to prevent back flow to the turbine. May also be supplied with the oil tripping cylinder, if desired.

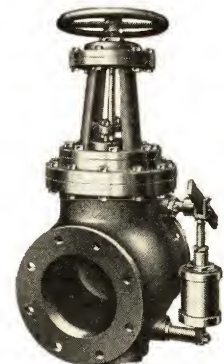


Fig. 233-A

## CATALOGS

Bulletins or black and white prints of equipment illustrated, or listed under "Products" will be gladly furnished, if you will indicate the regulating devices in which you are interested.

## ENGINEERING SERVICE

Our Engineering Department will gladly help you solve your difficult control problems without obligation.



# SKF INDUSTRIES, INC.

FRONT STREET AND ERIE AVENUE, PHILADELPHIA, PA.

District Offices in Principal Cities

## BALL AND ROLLER BEARINGS—PILLOW BLOCKS—HANGERS

Throughout every industry the letters SKF are synonymous with ball and roller bearings, pillow blocks and hangers that are built to the highest standards of quality. It is the one outstanding reason why "SKF Performance Takes Preference Over Price" with the leading manufacturers in every line of endeavor for new equipment, as well as for replacements on existing installations.

Have you a troublesome plain bearing in your plant? Set the job right once and for all and know what it is to have absolute freedom from bearing problems and keep production schedules uninterrupted by installing SKF Ball or Roller Bearings



in SKF Pillow Blocks. They reduce friction, save power and lower maintenance. It makes little difference how big or small the job may be, huge drive shafts, fans, blowers, or some small equipment with out-board bearings—for every replacement, SKF has the right bearing for the right place. SKF Bearings and Pillow Blocks are made to fit shafts  $\frac{5}{8}$  to  $14\frac{3}{4}$  inches in diameter.

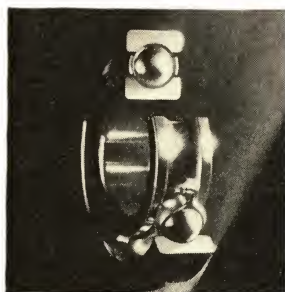
And don't forget your lineshafts. Their performance can be bettered by a change to SKF Self-Aligning Ball Bearing Hangers, of which there are today more than 3,000,000 in satisfactory service in varied industries throughout the world.

### SKF BALL AND ROLLER BEARINGS



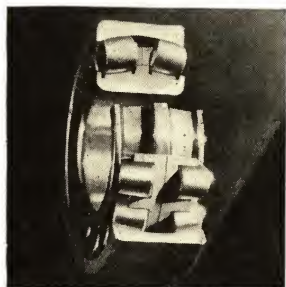
**SKF Self-Aligning Ball Bearing**

Has two rows of balls and the inherent ability of compensating automatically for angular misalignment or shaft deflections.



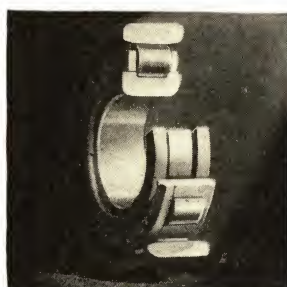
**SKF Deep-Groove Ball Bearing**

Because of its construction will carry radial load, thrust load or any combination of the two. Made with single and double rows of balls.



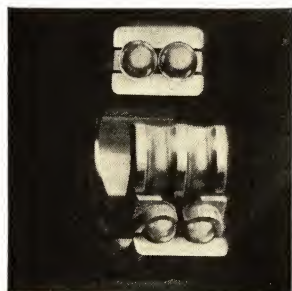
**SKF Spherical Roller Bearing**

For the brute jobs of industry, designed to meet space limitations where greater compactness for a given capacity is required.



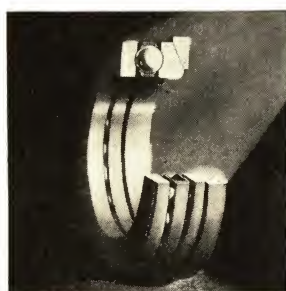
**SKF Cylindrical Roller Bearing**

Has a single row of cylindrical rollers and is designed essentially to carry radial load only. Made in light, medium and heavy series.



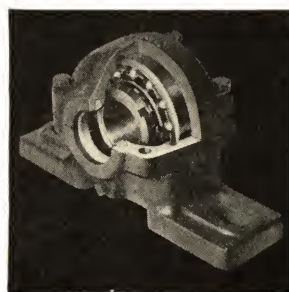
**SKF Deep-Groove Double Row Ball Bearing**

Designed on the same principles as single row deep-groove bearing but provides about twice the capacity.



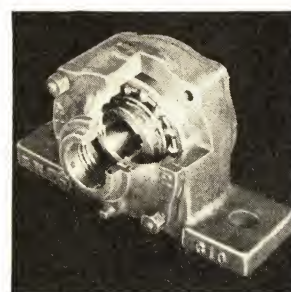
**SKF Ball Thrust Bearing—One Direction—Aligning**

Used for thrust loads only. This is the simplest form of all anti-friction bearings.



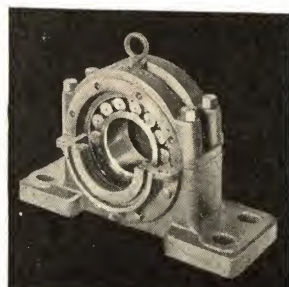
**SKF Split Pillow Block**

For normal and heavy duty standard applications. Can be furnished to provide for locating the bearing (held type). May be supplied with flingers. Can be provided with one end closed.



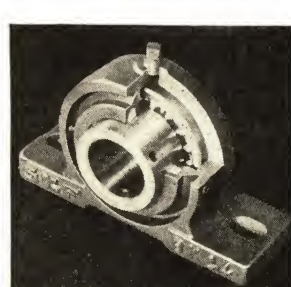
**SKF Universal Pillow Block**

For the varying and exacting requirements of machine applications. Furnished with end covers, of free or stabilizing types. Can be supplied with flingers where operating conditions warrant.



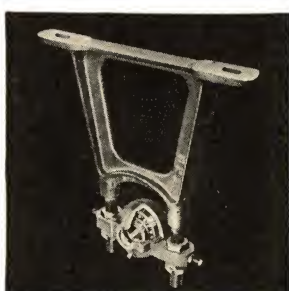
**SKF Roller Bearing Pillow Block**

For the most severe application in industry. Removable split end covers facilitate assembling. Supplied with flingers. Heavy construction assures ample capacity.



**SKF Unit Pillow Block**

For light applications where simplicity of installation is desired. In this Pillow Block the "X" or extended inner race bearings are used, provided with set screws for locking to standard shafts.



**SKF Self-Aligning Ball Bearing Hanger**

Uses the SKF Self-Aligning Ball Bearing. Easily erected. Effects material savings in power, lubricant and maintenance.



**SKF Fan Box**

For universal use on majority of fans and blowers. Permits easy replenishing of lubricant.



# SARCO COMPANY, INC.

183 MADISON AVE., NEW YORK, N. Y.

*Manufacturers of Steam Specialties*

Branches in All Principal Cities

SARCO CANADA LIMITED, Federal Building, TORONTO, ONT., CANADA

## PRODUCTS:

SARCO STEAM TRAPS, TEMPERATURE REGULATORS, STAINERS. Also Radiator Traps, Packless Inlet Valves, Air Eliminators, Return Traps, Alternating Receivers, Compound Gauges, Damper Regulators, Pipe Savers, Dial and Recording Thermometers, etc.

### SARCO STEAM TRAPS, TYPES 9, 8 AND S-75:

**Type No. 9:** This is a thermostatic trap, suitable for individual trapping of all types of steam heated equipment. It is low in first cost, of small size and easy to install, going into the pipe like a fitting.

The No. 9 Trap is self-adjusting and works equally well on steady or fluctuating pressures. The discharge valve is operated by a helical bellows containing a volatile fluid. The moment live steam reaches the trap this fluid expands and closes the valve tightly. As condensate collects, the bellows contracts and opens the valve. Will not stick, freeze or air bind.

Type 9-1 for pressures 0 to 30 lb. Brass valve head and seat.

Type 9-2 for pressures from 0 to 100 lb. Stainless steel valve head and seat.

**Type No. 8:** This trap utilizes the hydraulic pressure of a heavy hydrocarbon oil hermetically sealed in a metal tube. Due to the irresistible force of expanding oils, this trap is unfailing in action.

A simple adjustment enables the user to adapt the trap for use at various pressures.

**Type No. S-75 for Process Steam:** Employs the same principle as the No. 9 Trap, but has union inlet connection and nickel plated body. It has renewable stainless steel valve head and seat. Recommended for installations where process steam is used up to 100 lb. pressure. *Write for Catalog U-48.*

### SARCO COMBINATION FLOAT AND THERMOSTATIC STEAM TRAP FTO-H:

For heavy service, where large quantities of very hot condensate form more rapidly than they can be handled by thermostatic means alone, such as large unit heaters, steam coils, hot water service tanks, etc., when using high pressure steam.

Body is cast iron, light enough to be supported directly on piping. A heavy, seamless copper float opens the discharge valve through a simple toggle mechanism, as condensate accumulates in the trap. Valve head and renewable seat are stainless steel to

withstand the scoring action of scale and sediment, and prevent wire drawing.

A thermostatic air vent is built right into the trap near the top. This consists of a small valve actuated by a helically coiled bellows, partly filled with a volatile liquid. The valve is held open as long as there is air in the trap, but closed tightly as soon as steam reaches it and causes the bellows to expand.

All working parts are attached to the cover so that they are easily inspected by removing the trap body without disturbing any piping connections. For pressures up to 180 lbs. per square inch. *Write for Catalog U-38.*

### SARCO TEMPERATURE REGULATOR:

From 0° to 300° F.

Sarco Temperature Regulator is operated by an extremely sensitive liquid and is instantly responsive to the slightest fluctuation in the temperature of atmosphere or liquids. It requires no external operating means, such as compressed air, water or electricity.

Sarco Regulators are substantially constructed. The valve is balanced and packless.

Suitable for steam, water, oil and gas, and can also be had in the "reverse acting" type, to open with rise of temperature.

A 6-ft. connecting tubing between the thermostat and valve is furnished with the regulator, but when needed, longer tubings are supplied at a slight additional cost.

Type TR-21 is designed for tank, heater, steam jacket and duct control, and has an adjustment range of 30° F.

Type KR-14 is designed for room and dry kiln control, and has an adjustable range of 30° F.

Types KR-25 and TR-25 have a range of 100° F. The latter is designed for liquid, the former for room control. *Write for Catalog U-52.*

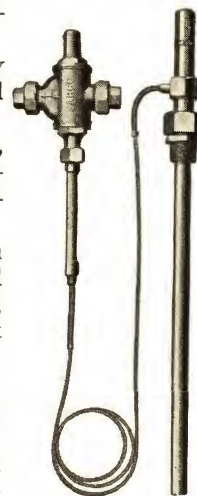
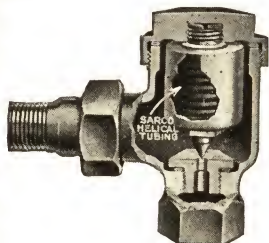
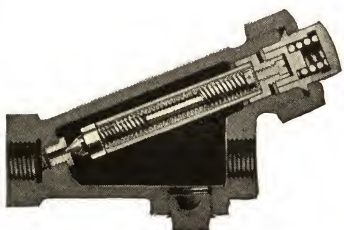
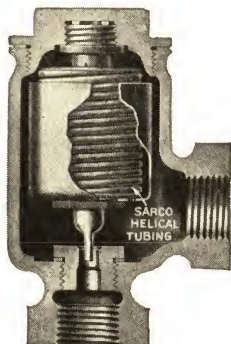
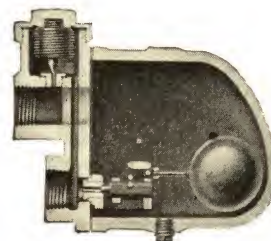
### SARCO SELF-CLEANING STRAINER:

Sarco Strainer is suitable for use on steam, gas, water, oil, etc. It has a cast iron body with perforated cylinder placed at such an angle as to offer minimum obstruction to the flow of gas or liquid, but allowing ample cleaning space. The standard screens are made of perforated brass, but where specified, monel or other metal screens can be supplied to practically any specifications.

Can be placed in horizontal or vertical lines or at any angle. A blow-off connection permits the strainer being cleaned instantly merely by opening the valve.

Made in sizes  $\frac{1}{4}$  to 8 in.; also furnished with brass bodies, caps and screws in sizes  $\frac{1}{2}$  to 1 in., inclusive.

*Write for Catalog U-67.*





# SCHUBERT-CHRISTY CORPORATION

PLANT AND EXECUTIVE OFFICES  
GEORGIA STREET, FRISCO RAILROAD AND NEW HAMPSHIRE AVENUE  
AFFTON (SUBURB OF ST. LOUIS), MO.

Telephone: Swifton 6701

P. O. Box No. 467

Cable Address: "CHRISBERT"

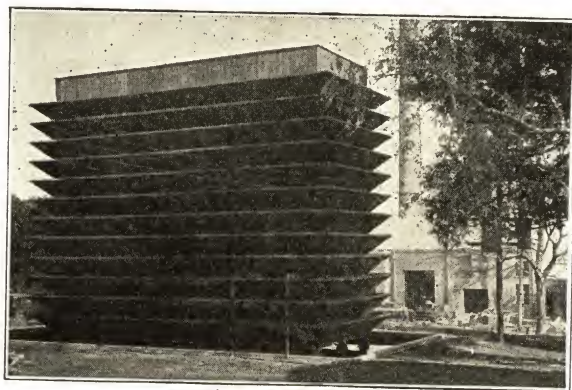
Sales Offices in Principal Cities

*Manufacturers of "Schubert-Christy" Atmospheric, Forced, Induced and Combination Draft Towers; Aluminum Alloy Propeller Fans; Low Speed Disc Type Fans and "Hi-Spra" Spray Nozzles*

## COOLING TOWERS:

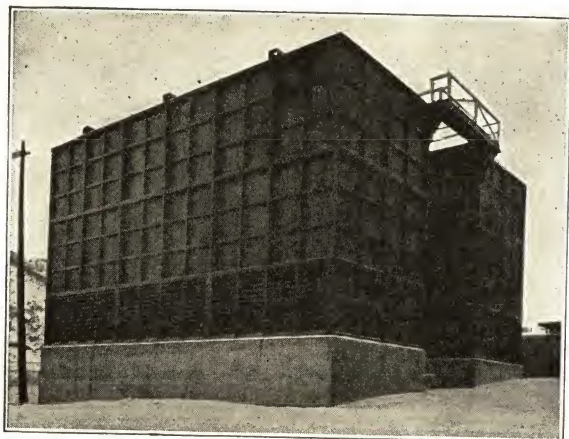
**Material and Workmanship:** Schubert-Christy Cooling Towers are constructed of either genuine red swamp cypress, redwood, steel or concrete, to best meet conditions. Carefully selected timber, specially treated with wood preservative of high penetrating power, is used in the construction of the cypress or redwood towers. All metal parts are thoroughly rust-proofed. Splash plates, water distributors, and similar interior parts, where exposed to action of water, are of bakelite, aluminum, pure copper, lead, bronze,

**Atmospheric Type:** Combines maximum efficiency with best appearance and general utility. The water is cooled to within a few degrees of the existing wet bulb temperature, with very low pumping cost. Wide louvers and GRAVITY WATER DISTRIBUTION are standard equipment. Towers can be installed upon the ground, roof, elevated steel work, or in other suitable location.



Atmospheric Type

**Induced Draft Type:** In this type of tower the fans operate in a horizontal plane at the top of the tower. This construction has many advantages over the ordinary mechanical draft types. The fans handle only the warm exhaust air, eliminating the danger of ice forming on the blades during winter operation. Noises caused by the operation of the fans are thrown upward, effectively quieting them. The actual air velocity through the tower is very low, preventing shattering of the water raining through the tower. The result is a cooling tower exceptionally free from drift loss. Placing the fans above the filling makes fan houses unnecessary. This simplifies the foundation, reduces space required, lowers pumping head and improves the appearance of tower. The fan, motor, and other mechanical parts are all mounted on a self-contained chassis of great strength.



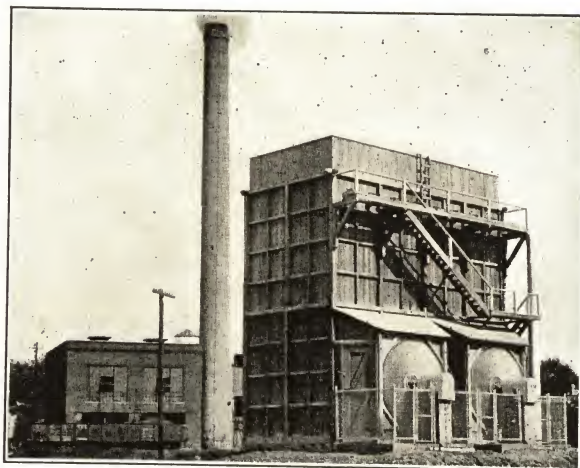
Induced Draft Type

or other non-ferrous composition. Towers are proportioned and equipped to operate successfully under most adverse weather conditions, under sustained overload periods and with waters containing solids, acids, or alkali.

A complete engineering specification covering recommended cooling tower is submitted with each proposal.

Four large mills and a well regulated manufacturing plant insure quick shipments. Efficient production methods permit the quotation of attractive prices.

**Forced Draft Type:** This type is distinguished by its great strength and the extremely low distance from top of foundations to center line of warm water inlet. Relatively large quantities of water are cooled through a large temperature range to within a moderate degree of the wet bulb temperature. Either airplane type propellers or disc type fans are furnished to suit requirements.



Forced Draft Type

**Combination Forced and Natural Draft Type:** The characteristics of this type are similar to those of the forced draft type, except that its capacity is greater and that it can be operated without fan power during a large portion of the year.

Heavy framework and carefully developed construction details insure great strength as well as long life. Large natural draft air inlets are provided so that fans may be shut down during the colder months of the year, resulting in considerable saving of fan power.

Schubert-Christy Cooling Towers are in operation in this country and abroad, under many different kinds of service. In power plants they serve Allis-Chalmers, Elliott, General Electric, Murray and Westinghouse turbines. In oil engine plants they serve Busch-Sulzer, Cooper-Bessemer, Fairbanks-Morse, Fulton, McIntosh-Seymour, Nordberg and Worthington Diesel Engines. In ice plants they furnish the cooling water for Ball, Carbondale, DeLaVergne, Frick, Vilter, Vogt and York equipment.

In general, these towers have earned for themselves an enviable reputation for absolute reliability, high efficiency and good appearance.



Large Atmospheric Type



# SCHUTTE & KOERTING CO.

MAIN OFFICE AND WORKS  
1165 THOMPSON ST., PHILADELPHIA, PA.

Branch Offices and Sales Agents in All Leading Cities

## JET APPARATUS:



Eductor

**Injectors:** For feeding boilers. Double tube design.  $\frac{1}{4}$ " to 3". *Bulletin 1A.*

**Syphons and Eductors:** For lifting and pumping water and other liquids, by live steam or pressure water.  $\frac{1}{2}$ " to 12". Bronze, iron and lead. Hand operated or automatic types. *Bulletins 2-A and 2-M.*

**Steam Jet Heaters:** For water and other liquids. Noiseless and Circulating types for open tanks. Bronze, iron and lead.  $\frac{1}{2}$ " to 6". Continuous type for pipe lines.  $\frac{1}{2}$ " to 6". *Bulletin 3-A.*



Pump Primer

**Exhausters and Blowers:** For handling air and gases in evacuating, priming, blowing and compressing operations. Steam jet and water jet types. Bronze, iron and lead. *Bulletins 4-A, 4-E, 4-F, and 4-P.*

**Obnoxious Vapor Condensers:** For handling objectionable gases. Water spray type. 6" to 60". *Bulletin 4-R.*

**Spray Nozzles:** For atomizing water and other liquids in moistening, washing and other processes. Brass, iron, steel and lead.  $\frac{1}{8}$ " to 3". *Bulletin 6-A.*



Desuperheater

**Desuperheaters:** For removing excess heat from superheated steam. Spray and surface absorption types, with or without reducing valves. *Bulletin 6-D.*

## HIGH VACUUM EQUIPMENT:

**Steam Condensers:** Multi-jet design, producing high vacuum without air pumps. Low level type for engines and turbines, Barometric type for evaporators, vacuum pans, etc. 5" to 60". *Bulletins 5-A and 5-AA.*



Hydro-  
Steam  
Air Pump

**Steam Jet Air Pumps:** Single nozzle and multi nozzle types. Single, two and three stage, jet or surface inter- and after-condensers. *Bulletins 5-E and 5-H.*

**Recooling Nozzles:** For recooling condensing water. Complete nozzle systems. Low working pressures. *Bulletin 5-N.*

**Vacuum Breakers:** For admitting air to vacuum equipment, such as exhaust lines and process vessels. Float and pressure controlled types. *Bulletin 8-V.*

## VALVES:

**Bronze and Forged Steel Valves:** Stop, check, stop check, lever, hydraulic and oil shutoff valves.  $\frac{1}{4}$ " to 4". *Bulletin 8-A.*

**Heavy Duty Steam Valves:** Stop, check, stop check and triple duty types. Iron and steel, for saturated and superheated steam. 2" to 12". *Bulletin 8-B.*



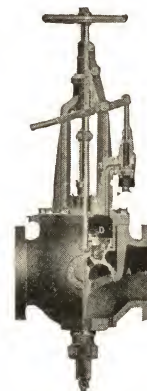
TRADE-MARK

**Trip Throttle Valves:** Balanced type. Steam or electric release. Iron and steel. 2" to 24". *Bulletins 8-C and 8-D.*

**Exhaust Line Valves:** Atmospheric relief, water check, back pressure and bleeder line valves. Iron and steel. Hand and cylinder operated. *Bulletins 8-E and 8-K.*

**Acid Valves:** For pipe lines carrying corrosive liquids and gases. Lead and lead lined types. Sizes 1" to 5". *Bulletin 8-L.*

**Reducing Valves:** For steam lines. Venturi type, motor or hydraulic controlled. Auld type with diaphragm control. Bronze, iron and steel. *Bulletin 8-R.*



Trip Throttle  
Valve

## HEAT TRANSFER EQUIPMENT:

**Evaporators:** For boiler feed water. Tubular construction. Capacities 4 to 40 tons per 24 hours. *Bulletin 10-E.*

**Heaters:** For feed water and fuel oil. Surface type. Multi-pass design. *Bulletin 10-F.*

**Radiafin Tubes:** For air heating and air cooling units. Extended surface design.  $\frac{1}{2}$ " to 6". Lengths up to 15'. Straight or coil shapes. *Bulletin 11-S.*

**Coolers:** For oil and jacket water. Surface type. Single and two pass designs. *Bulletin 12-C.*

**Inter and After-Coolers:** For compressed air and gases. Surface type. *Bulletin 12-G.*

**Heat Exchangers:** For oil and other liquids in process work. Surface type. Iron and steel. *Bulletin 12-H.*



Cooler

## GENERAL:

**Flow Indicators:** For checking flow in pipe lines.  $\frac{3}{8}$ " to 3". *Bulletin 6-F.* Also rotameters indicating rate of flow. *Bulletin 18-R.*

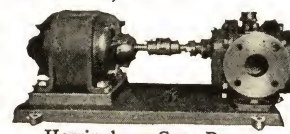
**Everdur Fittings:** For pipe lines carrying corrosive liquids and gases.  $\frac{1}{8}$ " to 4". *Bulletin 7-E.*

**Strainers:** For oil, water and other liquids, also live steam. Simplex and duplex types. *Bulletin 9-S.*

**Televisors:** For indicating liquid level in boilers and tanks installed at a distance. Operates electrically. *Bulletin 15-A.*

**Fuel Oil Burners:** Mechanical and steam-or-air-atomized types. Complete systems, including heaters, strainers, pumps, etc. *Bulletins 16-A, 16-G.*

**Gear Pumps:** For oil or other viscous liquids. Spur and herringbone gear types. Capacities up to 500 GPM. *Bulletin 17-A.*



Herringbone Gear Pump



# SCOVILL MANUFACTURING CO.

WATERBURY, CONN.

BOSTON

PROVIDENCE  
CHICAGO

NEW YORK  
CINCINNATI

PHILADELPHIA  
SAN FRANCISCO

ATLANTA

SYRACUSE  
LOS ANGELES

DETROIT

IN EUROPE: THE HAGUE, HOLLAND

## PRODUCTS:

BRASS, BRONZE and NICKEL SILVER MILL PRODUCTS. CUP-DRAWN ADMIRALTY, SEAMLESS MUNTZ, "ALCUNIC" and "ADNIC" CONDENSER TUBING. BRASS and COPPER PIPE. CAP and MACHINE SCREWS, SCREW MACHINE PRODUCTS. Fabricated metal parts and complete articles of every description made to order.

## MANUFACTURED GOODS:

Scovill offers a complete manufacturing service for the production of finished metal articles packed for shipment to the consumer or partially fabricated products ready for further mechanical operation. In many cases the Scovill-made parts are combined with other parts made by the customer and the whole assembled to make the complete product. Practically any desired combination of operations and finishing methods is available.

If you require parts or products made from brass, bronze, nickel-silver, steel, zinc, aluminum or other metals, either finished, packed ready for sale or in a semi-finished state, Scovill can handle this work for you both economically and effectively. A representative from any of the offices listed above will be glad to further explain the possibilities of this method for economical manufacturing.

## MILL PRODUCTS:

**Sheet:** With over seventy standard alloys and a long list of alloys developed for special purposes, Scovill has a metal to meet practically any requirement for a copper alloy. The metal is available in coils or sheets, drawn rods, extruded shapes, tubing and wire. Sheet metal can be furnished patent leveled where desired. This material can be furnished in all gauges and tempers for manufacturing operations such as stamping, drawing, spinning, etc.

**Scovill High Speed Brass Rod:** A very free cutting leaded brass rod for high speed production on automatic screw machines. It is free from hard spots and uniform both as to size and temper. Where long tool life, accuracy of product and high speed production are important this rod will be found ideal. A representative from any of the offices listed above will be glad to further explain its possibilities to you.

**Rod:** Scovill rods are available extruded and drawn in round, square, rectangular, hexagonal and special shapes. In many cases surprising economies can be effected through the use of shaped extruded rod to replace machined sections.

**Wire:** Wire from the Scovill mills furnished in various alloys and a variety of shapes is used in the manufacture of screws and rivets, common and safety pins, springs of all types and shapes, Fourdrinier screens for paper making, wire screens for filtration purposes and a long list of other products. Whether there is a color to be matched, a temper to be duplicated or an unusual condition to be met, Scovill engineers can specify a material to meet the requirements precisely.

**Tubing:** Scovill seamless drawn commercial tubing is made in several alloys and in sizes from  $\frac{3}{16}$  to  $3\frac{1}{2}$ -in. diameters with practically any wall thickness required. Scovill tubing has a smooth, even surface and will be found very satisfactory for fabrication or other manufacturing purposes.



## CONDENSER TUBING:

The Scovill Engineering Department has a special section giving particular attention to condenser tube problems. Over a period of several years' specialization in this field a fund of information of considerable value has been accumulated in overcoming condenser tube troubles. When so requested this department will gladly work with your engineers toward the solution of any condenser tube problems you may be facing. Write to the Waterbury office for this service.

**Cup-drawn Admiralty:** Where operating conditions are severe and the circulating water is either fresh or salt water polluted with acid, mine wastes or sewage, Scovill Cup-drawn Admiralty Condenser Tubing has a satisfactory life. Made by the cup-drawn process it is free from internal flaws, has a smooth, clean, polished surface both inside and out. It has a high resistance to corrosion. Scovill Cup-drawn Admiralty Tubing is also very satisfactory for heat exchanger service.

**Seamless Muntz:** Where uncontaminated fresh water is used for circulation, Scovill Seamless Muntz Condenser Tubing has a very satisfactory life and is the most economical material for use in such conditions.

**"Alcunic":** "Alcunic" Condenser Tubing should be specified where an aluminum, copper, nickel alloy tube is required.

**"Adnic":** "Adnic" is a 70% copper, 29% nickel, 1% tin alloy and is recommended for the most severe condenser, heat exchanger and evaporator conditions.

## SCREW PRODUCTS:

**Cap Screws:** Scovill cap screws in brass and steel with hexagon, fillister, flat or button heads are made to the American Standard Specifications. The heads are uniform in size and finely finished. Their unusually high and uniform tensile strength provides a surplus strength above any strain they will ever encounter in actual service. Large stocks are maintained at Waterbury, Chicago, Cincinnati and San Francisco.

**Special Screws:** We have complete facilities for reheating, clipping, drawing, drilling cross holes, and machining bodies to requirements both on cap and machine screws. Improvements in methods of manufacture have made it possible to produce screws of special shape which will replace expensive screws previously possible only by casting and machining. We have very complete facilities for handling this type of work.

**Screw Machine Products:** Scovill can handle orders for practically any quantity of screw machine products in any size from the very smallest up to products made from  $1\frac{1}{2}$ -in. diameter rod. Turned from Scovill High Speed Brass Rod or any other non-ferrous or ferrous material they can be furnished to very close limits of accuracy.



# SHAKEPROOF LOCK WASHER CO.

Distributors of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS

2561 NORTH KEELER AVENUE, CHICAGO, ILL.

Lock Washers and Locking Terminals

## SHAKEPROOF LOCK WASHERS

United States Patents Nos. 1,419,564; 1,604,122; 1,697,954; 1,782,387 (Others Pending).

Designed to lock nuts positively and to eliminate the many mechanical and production troubles found in other types of washers. Their efficiency is attested by the fact that they are used on practically every automobile manufactured and by more than 150 other types of industry—good evidence of their universal application and success.

Shakeproof Lock Washers are made of tool steel, spring tempered. Twisted teeth, evenly spaced around the entire washer, act similar to that of ratchet pawls permitting movement in one direction and resisting any movement in the reverse direction. Vibration imbeds these spring steel twisted teeth in both nut and work surface, thus vibration adds to the holding power of Shakeproof Lock Washers. Made in a circle (no split) the spring of each twisted tooth is distributed equally around the entire nut, thus affording utilization of entire bolt head or nut surfaces.



Showing the Biting Action of the Shakeproof Twisted Teeth on the Under Surface of the Nut When Tightened Down

Shakeproof Lock Washers are *tangleproof* and *spreadproof*! These features alone have saved many manufacturers a countless amount of time in assembly. They are easily and rapidly applied; their lighter weight saves in shipping costs and permits the use of shorter bolts.

Shakeproof Lock Washers are made in sizes to cover practically every application in industry—Steel and Bronze in any standard finish.

Make a test of these facts in your own shop. We will gladly send, upon request, as many washers as you need in any size.

### ENGINEERING SERVICE:

The Shakeproof principle can be adapted to any locking problem. Submit your problems to our engineers and we will gladly make recommendations without obligation. We are also equipped to produce metal stampings, including spring washers and tension washers of special design.

**Type 11 External Tooth:** Made with twisted teeth on the outside circumference for use with U. S. Standard Bolts and Nuts.



DIMENSIONS, TYPE 11 EXTERNAL TOOTH

Stock No.	Screw or Bolt Size	O.D.	Thickness	Code
1104	No. 4	$\frac{11}{16}$	.018	Abandon
1106	No. 6 and $\frac{1}{8}$	$\frac{13}{16}$	.018	Abess
1108	No. 8 and $\frac{3}{8}$	$\frac{15}{16}$	.021	Abbott
1110	No. 10 and $\frac{1}{2}$	$\frac{17}{16}$	.024	Abdal
1114	$\frac{1}{4}$	$\frac{19}{16}$	.030	Abduct
1118	$\frac{3}{8}$	$\frac{21}{16}$	.035	Abeam
1120	$\frac{1}{2}$	$\frac{23}{16}$	.035	Abel
1122	$\frac{3}{4}$	$\frac{25}{16}$	.040	Aberr
1124	$\frac{1}{2}$	$\frac{27}{16}$	.040	Abhor
1126	$\frac{3}{4}$	$\frac{29}{16}$	.040	Ability
1128	$\frac{1}{2}$	$\frac{31}{16}$	.050	Abrupt
1132	$\frac{3}{4}$	$\frac{35}{16}$	.050	Absent
1134	$\frac{1}{2}$	$\frac{37}{16}$	.062	Abstain
1136	1	$\frac{39}{16}$	.062	Absorb

**Type 15 Countersunk:** For Flat and Oval head screws. Fits under head crown shape.



DIMENSIONS, TYPE 15 COUNTERSUNK

Stock No.	Screw or Bolt Size	O.D.	Thickness	Code
1506	No. 6 and $\frac{1}{8}$	$\frac{11}{16}$	.016	Heap
1508	No. 8 and $\frac{3}{8}$	$\frac{13}{16}$	.018	Health
1510	No. 10 and $\frac{1}{2}$	$\frac{15}{16}$	.021	Hear
1512	No. 12	$\frac{17}{16}$	.021	Heart
1514	$\frac{1}{4}$	$\frac{19}{16}$	.021	Heat
1516	No. 16	$\frac{21}{16}$	.024	Head
1518	$\frac{3}{8}$	$\frac{23}{16}$	.028	Heal
1520	$\frac{1}{2}$	$\frac{25}{16}$	.030	Hide

**Type 12 Internal Tooth:** With twisted teeth on the inside of washer for use with S. A. E. Bolts and Nuts, Standard Machine Screws.



DIMENSIONS, TYPE 12 INTERNAL TOOTH

Stock No.	Screw or Bolt Size	O.D.	Thickness	Code
1202	No. 2	$\frac{11}{16}$	.010	Bate
1203	No. 3	$\frac{13}{16}$	.012	Bend
1204	No. 4	$\frac{15}{16}$	.014	Bay
1206	No. 6 and $\frac{1}{8}$	$\frac{17}{16}$	.018	Bark
1208	No. 8 and $\frac{3}{8}$	$\frac{19}{16}$	.018	Bank
1210	No. 10 and $\frac{1}{2}$	$\frac{21}{16}$	.021	Bayou
1212	No. 12	$\frac{23}{16}$	.021	Bow
1214	$\frac{1}{4}$	$\frac{25}{16}$	.024	Bead
1218	$\frac{3}{8}$	$\frac{27}{16}$	.030	Beak
1220	$\frac{1}{2}$	$\frac{29}{16}$	.035	Bear
1222	$\frac{3}{4}$	$\frac{31}{16}$	.035	Beast
1224	$\frac{1}{2}$	$\frac{33}{16}$	.040	Beaver
1226	$\frac{3}{4}$	$\frac{35}{16}$	.040	Beck
1228	$\frac{1}{2}$	$\frac{37}{16}$	.045	Bed
1232	$\frac{3}{4}$	$\frac{41}{16}$	.050	Beef
1234	$\frac{1}{2}$	$\frac{43}{16}$	.050	Bean
1236	1	$\frac{45}{16}$	.062	Best

### SHAKEPROOF LOCKING TERMINALS:

One of the many adaptations of the Shakeproof locking principle. In radio and electrical parts, where tight connections are necessary for positive contact, Shakeproof Locking Terminals are being used by



practically every manufacturer. Shakeproof's twisted teeth bite in, thus eliminating all troubles experienced from loose terminals.

We can supply over fifty stock types for all standard size holes. Write for catalog and samples.



# THE SHARPLES SPECIALTY COMPANY

2357 WESTMORELAND ST., PHILADELPHIA, PA.

*Centrifugal Engineers*

DOMESTIC OFFICES: Boston, New York, Pittsburgh, Detroit, Chicago, Tulsa, San Francisco, Seattle, and Vancouver, B. C.  
FOREIGN OFFICES: Super Centrifugal Engineers, Ltd., 101 Grosvenor Road, London S. W. 1, England. Ste. Ame. Des Appareils Centrifuges, 70 Rue Du Vieux Pont, Rueil (Seine-et-Oise) Paris, France. Tatsumi Commercial Corp., Marine Insurance Bldg., Tokio, Japan.  
Honolulu Iron Works, Honolulu, T. H. E. J. Neil Company, Manila, P. I.

## APPLICATION IN INDUSTRY

**Purification of:** Lubricating Oils—Fuel Oils—Insulating Oils.

**Clarification of:** Oils—Inks—Syrups—Corrosive Liquids—Paints, Lacquers, Enamels, Varnishes—Fruit Juices—Extracts—Dye Pastes—Pharmaceuticals—Serums—Bacteriological Preparations—etc.

**Dehydration of:** Essential Oils—Edible Oils—Mineral Oils—Tars—Dielectric Oils—etc.

**Recovery of:** Liquids from other liquids—Solids from suspension—Liquids from emulsions—Waste products—etc.

**Regeneration of:** Absorption Oils—Dry Cleaners' Solvents.

**Dewaxing** Residue stocks, Heavy Distillates, Solvent Extracted stocks.

**Acid Treating** petroleum oils and gasoline (The Sharples Continuous Treating Process).

**Caustic Treating** vegetable oils (The Sharples Continuous Vegetable Oil Process).

**Dewatering** crystalline salts.

## ORGANIZATION

The Sharples Specialty Company comprises an engineering corps of centrifugal experts without parallel in their field, and a laboratory service capable of co-operating to the fullest extent with the various industries. Samples tested without obligation or charge.

### STANDARD SUPER CENTRIFUGE (Fig. 1)

The Standard Super Centrifuge generates the highest centrifugal force used commercially. It operates usually at a speed of 15,000 r.p.m., developing a separating force over 13,000 times that of gravity.

One of the outstanding features of the Sharples Super Centrifuge is its complete freedom from complicated internal mechanism.

The revolving bowl of the Super Centrifuge consists of three simple parts. The entire machine is remarkable for its simplicity and is easier to operate and clean than any other high-speed centrifuge.

### EN BLOC (Fig. 2)

Complete oil purifying plant. Vapor-tite super centrifuge with pumps and heaters particularly adaptable for Diesel and Turbine Oil purification.

### PRESURTITE SUPER CENTRIFUGE (Fig. 3)

The patented air-tight construction recommends this machine where volatile liquids are involved. It also avoids danger from escaping gases.

### PORTABLE SUPER CENTRIFUGE (Fig. 4)

Truck-mounted. Complete, if desired, with pumps for feeding and for liquid trans-

fer, and with thermostatically controlled heater, with or without filter presses.

### CONTINUOUS REACTION-SEPARATION OUTFIT (Fig. 5)

Will meter two liquids (oil and acid for example), intimately mix them, heat the mix, and centrifugally separate the products of the reaction. Suited to chemical reactions where continuous flow and a clean split of the end products are desired.

This equipment is in wide use and has been developed to a high degree of accuracy for acid treating petroleum oil, acid treating gasoline, and caustic treating vegetable oil. Total time of mixing, heating, and separating can be varied from 30 seconds to any number of hours. The main components of the equipment are: (a) The Sharples Proportionometer; (b) a multistage mixer; (c) heater; (d) Super Centrifuge with sludge frame. The accompanying photograph shows the centrifuge only.

### ROTOJECTOR (Fig. 6)

A self-cleaning high speed centrifuge for clarification or separation where automatic bowl cleaning is required. Periodically discharges its bowl cake while running at full speed. Liquids with abnormally high solid content can now be clarified in a high speed centrifuge without high labor cost.

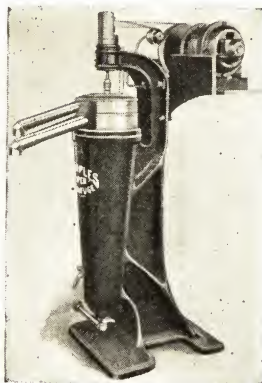


Fig. 1. Standard Sharples Super-Centrifuge

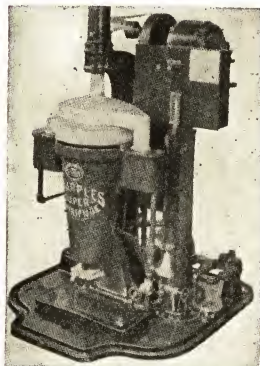


Fig. 2  
Sharples En Bloc

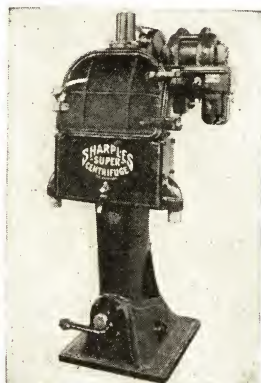


Fig. 3. Sharples Presurtite Super Centrifuge

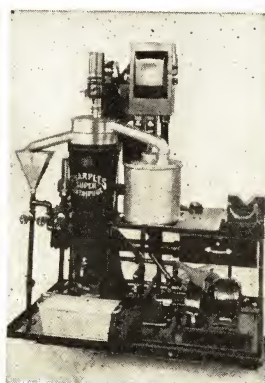


Fig. 4 Sharples Portable Super Centrifuge



Fig. 5 Sharples Continuous Reaction-Separation Outfit

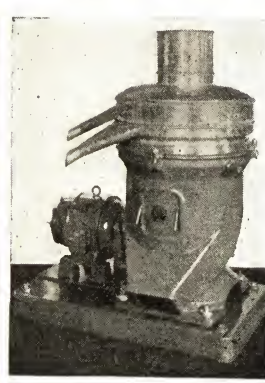


Fig. 6  
Sharples Rotojector



# SHEPARD NILES CRANE AND HOIST CORPORATION

435 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.

WORKS: MONTOUR FALLS, N. Y.; PHILADELPHIA, PA.

## BRANCH OFFICES

ATLANTA, GA.  
BIRMINGHAM, ALA.  
BOSTON, MASS.  
BUFFALO, N. Y.  
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DETROIT, MICH.  
HOUSTON, TEX.  
LOS ANGELES, CAL.

## EXPORT

LOUISVILLE, KY.  
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PITTSBURGH, PA.  
ST. LOUIS, MO.  
SAN FRANCISCO, CAL.  
SEATTLE, WASH.  
TORONTO, ONT.

SHEPARD DIVISION: 111 Broadway, New York, N. Y.

NILES DIVISION: NILES-BEMENT-POND Co., Foreign Department, 111 Broadway, New York, N. Y.

SPRAGUE DIVISION: INTERNATIONAL GENERAL ELECTRIC Co., SCHENECTADY, N. Y.

## PRODUCTS

ELECTRIC HOISTS (Cage and Floor Operated)  
SHEPARD MONORAIL TRACK  
ELECTRIC TRAVELING CRANES  
TRANSFER CRANES  
JIB CRANES  
GRAB BUCKET CRANES  
GANTRY CRANES  
ELECTRIC WINCHES  
CAR PULLERS  
WALL CRANES  
ELECTRIC CUPOLA CHARGING HOISTS AND CRANES  
HAND POWER CRANES  
BACK-GEARED MOTORS  
SPEED REDUCERS



## CO-OPERATIVE SERVICE AND CATALOGUES

The comprehensiveness of the Shepard Line permits the selection of the most efficient lifting and load-moving machinery for any particular need. This Company will plan, design and help in any way to determine where real savings can be made.

Catalogues describing Shepard Niles hoists and cranes are available.

Detailed data can be obtained from any of our branch offices.

## SHEPARD ELECTRIC HOISTS

For every application, floor or cage operation or remote control—high speed, close clearance, long lift, single or multiple hook—a hoist for every condition.

All hoists are of the "balanced drive" design, with mechanism totally enclosed in dust and moisture-proof housings, and lubricated by an oil bath to assure positive lubrication.

## FLOOR OPERATED HOISTS

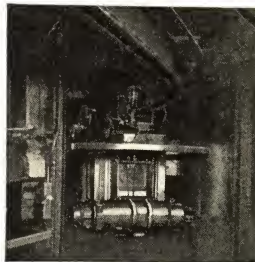
A comprehensive line of 1 and 2-motor floor controlled electric hoists with single or multiple speed control. Capacities from  $\frac{1}{4}$  to 20 tons, in the following types: Lug Suspension; Hook Suspension; Stationary; Push Trolley; Geared Trolley; and Motor Driven Trolley. Furnished with pendant rope, push button, outrig or remote control.



General Utility Compact Hoist

## CAGE OPERATED ELECTRIC HOISTS

Built in a variety of types from  $\frac{1}{2}$  to 10 tons capacity. For complete information write for Shepard's "Aerial Railway of Industry."



Monorail Track

## SPRAGUE VERTICAL WINCHES

Built in capacities up to 12 tons and available in a variety of speeds ranging from 10 to 150 ft. per minute for d-c. and a-c. circuits up to 550 volts.

Furnished with foot-operated non-reversible controller.

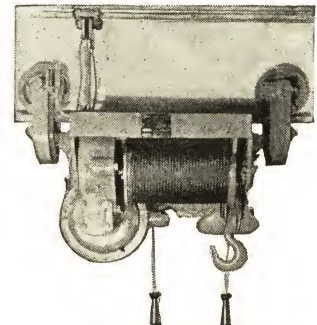
## SHEPARD MONORAIL TRACK

T-rails of special analysis steel provide a hard, smooth surface. Track is attached to I-beams by bolts and spreader castings. Large area bearings in trolley wheels insure great durability and long life.

## SPRAGUE ELECTRIC HOISTS

These hoists are featured by a worm gear drive which has few moving parts. The worm is also the load brake—the angle of the worm is such that it cannot overspeed in lowering.

All gears are entirely enclosed and packed in grease. Built in capacities of from  $\frac{1}{4}$  to 6 tons, for pendant rope, push button or foundry control.

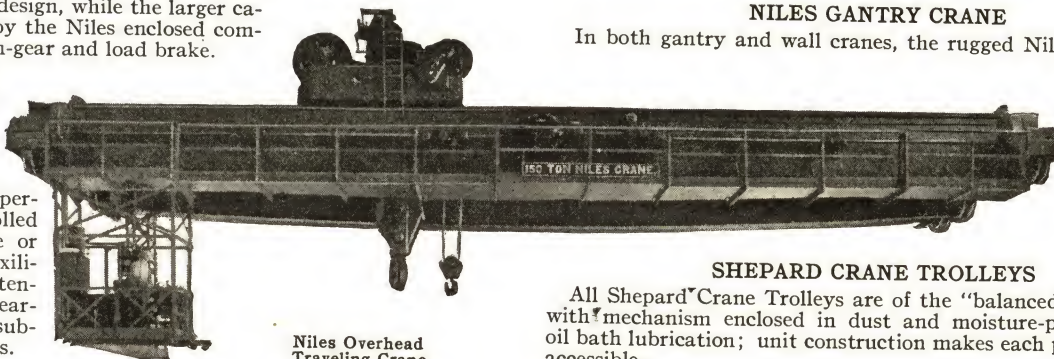


Worm Gear Electric Hoist

## ELECTRIC TRAVELING CRANES

A complete line in capacities from  $\frac{1}{4}$  to 450 tons. The small capacity cranes are of the Shepard "balanced drive" design, while the larger capacities employ the Niles enclosed compact reduction-gear and load brake.

**Types:**  
Overhead Electric Traveling Cranes:  
3-motor cage or floor operated; box or rolled girders; single or twin hook; auxiliary hoists; extension; close clearance and submerged trolleys.



Niles Overhead Traveling Crane

Grab bucket; single beam; double beam; gantry; jib; bracket and transfer cranes. Also special types.

## NILES GANTRY CRANE

In both gantry and wall cranes, the rugged Niles construction is evidenced.

All trolleys are of the compact reduction-gear and load brake design.

## SHEPARD CRANE TROLLEYS

All Shepard Crane Trolleys are of the "balanced drive" design with mechanism enclosed in dust and moisture-proof housings; oil bath lubrication; unit construction makes each part separately accessible.



# SKINNER ENGINE COMPANY

ERIE, PA.

*Manufacturers of High-Economy Steam Engines Exclusively*

Branches in All Principal Cities

## PRODUCTS:

### "Universal Unaflow" Engines:

Side Crank Horizontal . . . . .	75 to 1000 h. p.
Center Crank Horizontal . . . . .	75 to 400 h. p.
Vertical stationary Unaflow engines . . . . .	300 to 2000 h. p.
Vertical marine Unaflow engines . . . . .	600 to 2500 h. p.
Horizontal stern wheel river boat Unaflow engines.	

Variable speed Unaflow engines for compressor drive, with automatic speed control for any speed selected.

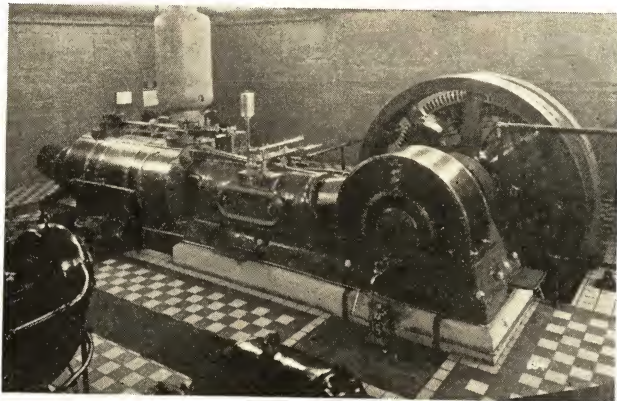
Unaflow engines for paper mills and other plants requiring variable amounts of steam for processing, the amount of current generated being controlled entirely by the amount of exhaust steam required.

### Steam-Tight-Valve Counterflow Engines:

Center Crank . . . . .	50 to 400 h. p.
Side Crank . . . . .	75 to 550 h. p.

## EXPERIENCE:

Builders of engines since 1868. Our plant is now the largest in the United States devoted exclusively to the building of steam engines; and the Skinner organization has justly acquired the reputation of being steam engine specialists.



Horizontal "Universal Unaflow"

## "UNIVERSAL UNAFLOW" ENGINES:

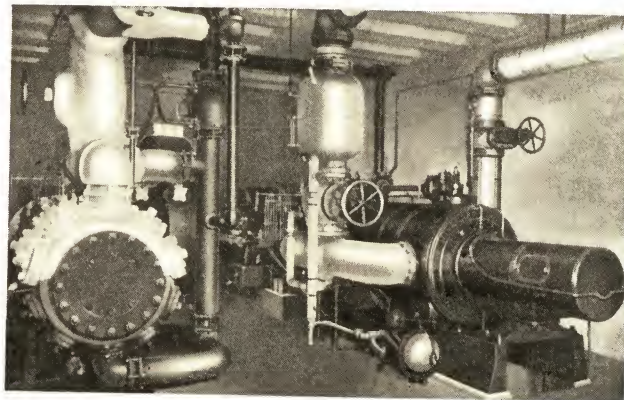
The "Universal Unaflow" was the first American poppet-valve Unaflow engine and is built under more than fifty patents owned exclusively by this company. Practically as many of these engines have been built as all the other makes of American Unaflow engines combined.

**Adaptability:** "Universal Unaflow" engines are built for the most exacting power requirements and operate condensing and noncondensing, the engine automatically changing its functioning with the change in the exhaust pressure conditions.

These engines are also built for high back pressures and tests under back pressures, either constant or variable, up to 25 pounds, with moderate steam pressures, have shown economies heretofore thought impossible. They are adapted to variable speed operation with either electric or mechanical control, which can be made manual or automatic.

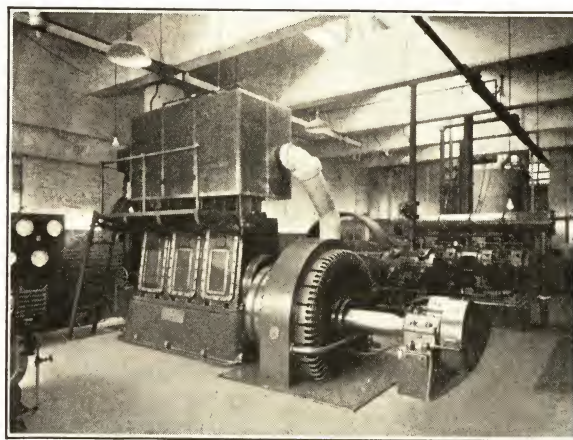
**Maintained Economy:** Economies are guaranteed to be maintained for extremely long periods, due to the patented construction of the admission and auxiliary exhaust valves, which cannot leak with use or under

any variation of steam pressure and temperature. Contracts are frequently made under a penalty of several thousand dollars a pound of steam per kilowatt-hour for failure to obtain guarantees after one year's operation, the purchaser withholding final payment until the guarantees have been complied with.



A "Universal Unaflow" Direct Connected to Ammonia Compressor

**Guaranteed Saving Contracts:** On account of the high economy of this engine, several hundred contracts have been made to replace central station current and other makes of engines under the Skinner Guaranteed Saving Contract, which provides for the engine paying a large part of its cost, and sometimes all of it, in the saving effected. Some contracts have been made amounting to over \$125,000.00, where the entire purchase price is to be paid in the saving effected against purchased current. "Universal Unaflow" engines have paid their entire cost, including cost of generator, against rates as low as 1.1¢ per kilowatt-hour, under this form of contract.



Vertical "Universal Unaflow"

## STEAM-TIGHT-VALVE COUNTERFLOW ENGINES:

Over 11,000 Skinner Steam-Tight-Valve Counterflow engines have been built and placed in practically every kind of industry. A telescopic valve is used which automatically expands as wear takes place and remains steam-tight for years.



# THE W. W. SLY MANUFACTURING CO.

Established 1874

MAIN OFFICE AND WORKS  
4709 TRAIN AVE., CLEVELAND, OHIO

## BRANCH OFFICES

NEW YORK  
CHICAGO  
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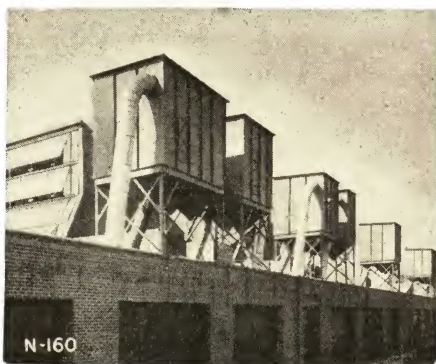
## PRODUCTS:

Blast-Cleaning Equipment—Rooms, Cabinets, Tables, Barrels; Nozzles; Tumbling Mills; Dust Collecting Systems; Helmets.

## SLY DUST FILTERS:

Sly Pioneered in the invention and development of positive dust collection and were the original patentees of the cloth arrester. Sly dust filters of today present the very latest achievement in dust collection—and are thoroughly standardized. First cost and operating cost are surprisingly low. Complete installation including hoods, piping, filters, fans, and erection on the job. . . .

Ask for complete descriptive literature. Give information as to kind of dust, fineness, specific gravity, temperature, moisture, volume of dust, method of dust disposal, etc. A sample of dust is desirable.



## SLY BLAST ROOMS:

For Sandblast, Shotblast, Gritblast: Sturdily constructed—downdraft ventilation keeps dust down—better visibility allows greater production with less rejects—simple lever control of blast operation gives the right mixture of air and abrasive for most efficient blast—automatic return of abrasive to tank—new and efficient abrasive cleaner adds to effectiveness of the blast. They may be equipped with standard items such as car, turntable, mono-rail, conveyor, to facilitate handling of work. Write for bulletin.

## SLY BLAST TABLES:

Automatic, continuous. Furnished with mechanical elevation of abrasive, new and improved abrasive cleaner, and continuous, automatic Sly Blast Tank. Operating cost is unusually low. Write for bulletin.

## SLY BLAST CABINETS:

For cleaning a widely diversified line of work by hand. They are outstanding in convenient operation and rugged construction. Write for bulletins.

## SLY BLAST MILLS:

The Sly Tilted Mill is a genuine money-saving blast cleaning unit. The rolling action constantly turns the work while blasting, assuring uniform cleaning. Write for bulletin.

## SLY TUMBLING MILLS:

Most modern in design—roller bearings throughout—simple, quick-operating door locks prevent distortion of door and barrel. These barrels are establishing new low cost records every day. Write for bulletin.

## SLY PURAIR HELMETS:

Most comfortable. They are light; have roomy neck for freedom of head movement; air is cleaned, cooled and deodorized and free from moisture and oil. A positive protection against injurious dusts and fumes. Write for bulletin.

# STICKLE STEAM SPECIALTIES CO.

MAIN OFFICE AND WORKS, INDIANAPOLIS, IND.

## SERVICES DEVELOPED IN 25 YEARS

A complete service of systems and equipment to automatically and economically control steam and condensation, to improve steam heating and industrial steam process installations.

These developments are briefly described below. Without obligation request bulletin for more complete information.

## ENGINEERING SERVICE

For adapting these systems and equipment to your requirements, local representatives, traveling sales engineers and supervising erection engineers are available.

## THE STICKLE AUTOMATIC DIFFERENTIAL VACUUM HEATING SYSTEM

Gives automatic temperature regulation with a saving of 20 to 30% in fuel. Automatically changes steam pressures from above to below atmospheric pressures, governed by weather conditions. Positive circulation assured.

Operating features are very simple and entirely automatic. The installations are made in present systems utilizing existing piping and radiation, at a very small expense and on an approval basis. In new layouts approved methods of figuring radiation, pipe sizes, etc., is not changed.

Bulletin No. CH101.

## THE STICKLE BLOWING THROUGH DRAINAGE SYSTEM (Patented)

Industrial steam drying machines are improved in operation. Elimination of air and condensation from each unit is assured. No traps used, no steam wasted. Ask for paper Bulletin No. C22 or textile Bulletin No. C40.

## THE STICKLE DIFFERENTIAL DRAINAGE AND BOILER RETURN SYSTEM

Industrial plants obtain 15 to 25% fuel savings over discharging high pressure condensation to tilting return traps, feed water heaters or hot wells. Trouble free operation of the drying, cooking or evaporating units obtained.

This is not a return trap system, but a pumping system to return condensation back to the boilers eliminating overflow wastes, reducing scale, boiler strain and leaks, reducing pumping costs, increasing the boiler capacity, eliminating high pressure steam trap troubles. Bulletin No. C50.

## THE STICKLE VAPOR VACUUM BLAST COIL HEATER (Patented)

An economizer to save the excess heat in condensation and escaped steam coming back in return lines from heating systems and process steam units. Bulletin No. C30 and No. C22.

## THE STICKLE RADIATOR SUPPLY VALVES

Made in straight and curved body designs. Approved spring-packless, quick opening, non-rising stem, renewable disc construction is used.

## THE STICKLE THERMOSTATIC RADIATOR TRAP (Pat.)

The diaphragm is loose, easy to remove for blowing the radiator free of scale and dirt, and easy to replace. The leaf spring makes a positive opening force. Bulletin No. C15.

## THE STICKLE BUCKET STEAM TRAP

The several types: high pressure, low pressure; thermic vacuum, will meet any steam trap requirement and are sold on approval, guaranteed in every respect. Bulletin No. C15.

## STICKLE OPEN HEATER AND PURIFIER

Stickles heaters are furnished with cast iron or steel shells built to withstand any back pressures. The Stickles principle assures maximum water temperature and removal of large quantities of scale forming particles. Bulletin No. C10.



Bucket Trap

## DEAERATING HEATERS

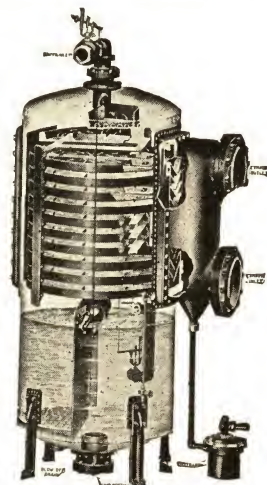
Completely remove oxygen and other gases from water.

## REDUCING AND BACK PRESSURE VALVES

A complete line of pressure regulating valves are carried in stock, in sizes from 1/2 inch to 16 inches. Bulletin No. C35.

## STICKLE TRIPLEX SEPARATOR

Has three large baffles. Low velocity and large baffle area give maximum separation. Bulletin No. C20.



Open Heater and Purifier



# SPRINGFIELD BOILER CO.

SPRINGFIELD, ILLINOIS

Manufacturers of "Springfield" Sectional—All Steel—Water Tube Boilers and Water Walls

## BRANCH OFFICES

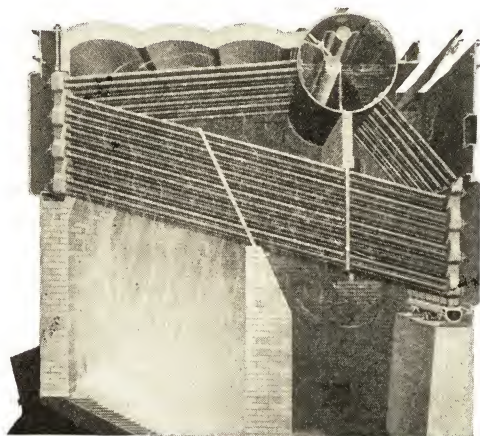
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PITTSBURGH

BOSTON  
MINNEAPOLIS

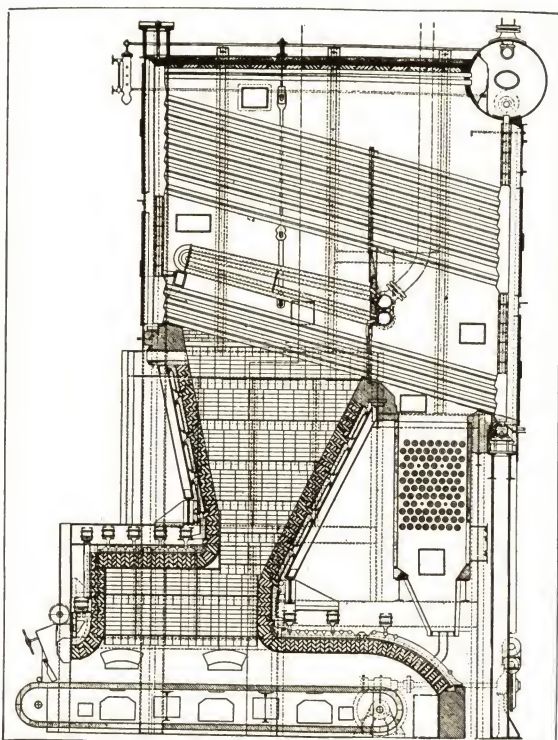
CINCINNATI  
WASHINGTON

NEW YORK  
KANSAS CITY

## SPRINGFIELD SECTIONAL ALL-STEEL WATER TUBE BOILERS AND WATER WALLS:



On this page is illustrated a standard "SPRINGFIELD" Sectional All-Steel Water Tube Boiler (built in all sizes and for all working pressures); also one complete header section showing method of suspension, baffling extending the entire height of section and each hand-hole covering four tubes.



One of Five 916 H.P. Springfield Units Installed in the Whippany, N. J., Plant of Jersey Central Power & Light Co.

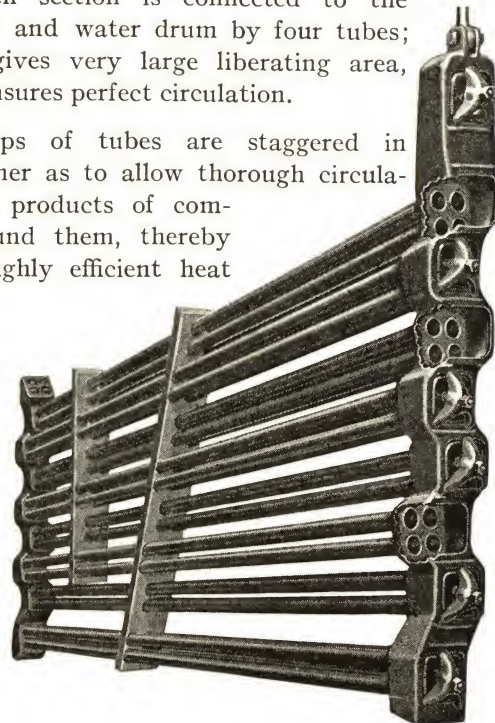


TRADE-MARK

Each section is connected to the steam and water drum by four tubes; this gives very large liberating area, and insures perfect circulation.

The groups of tubes are staggered in such a manner as to allow thorough circulation of the products of combustion around them, thereby producing highly efficient heat transfer.

Boiler is very compact; occupies less space than other boilers of like capacity and requires less brick for its setting; approximately 97 per cent of the total heating surface is *in the tubes*.



The baffles in "SPRINGFIELD" boilers are *water cooled* cast iron frames with open face and cast iron sleeves through which the tubes pass. They are of the filled type, the filling being of refractory material supported by the cast iron frame and forming a solid wall. Any tube may be taken out without disturbing the baffles or other parts of the boiler.

## SPRINGFIELD PEEP HOLE DOORS:

Simple, safe  
and efficient.

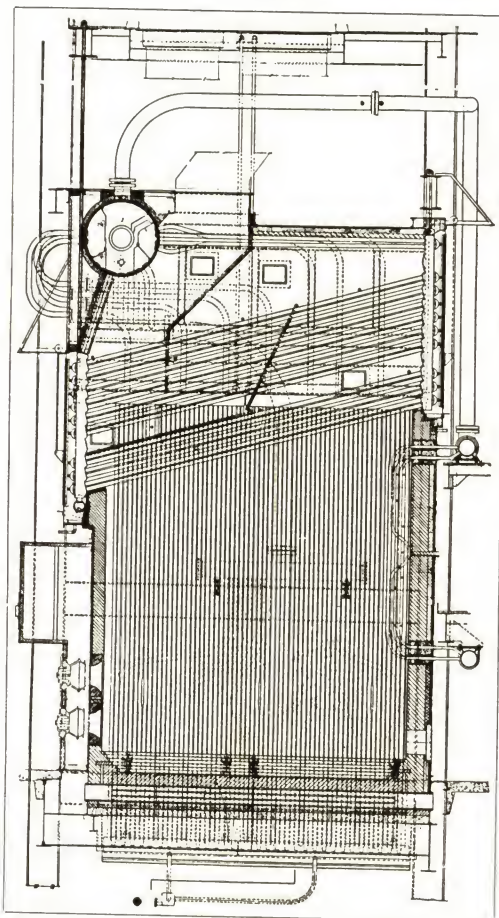




## SPRINGFIELD BOILER CO.

### SPRINGFIELD WATER TUBE BOILERS WITH WATER WALLS:

**Sectional—All Steel:** Our forty-four years' experience in the design and manufacture of boilers has fitted us for the manufacture of the present-day highly efficient steam generating unit of superior design and construction. Within the past decade, greater advancement in boiler practice has been made than ever before. This relates not only to the larger sized units and higher pressure being used today, but also to the design and construction of the boiler itself. The "SPRINGFIELD" Boiler is among the foremost in this advancement and this Boiler has become more constantly recognized by large power users and leading engineers than any other boiler on the market.



One of Three Units Each Designed to Generate 180,000 Lbs. of Steam per Hour at 450 Lbs. Pressure at the Arthur S. Huey Memorial Generating Station, Oklahoma City Plant of the Oklahoma Gas & Electric Co. Bylesby Engineering & Management Corp'n, Chicago, Engineers

It contains all those features which always have been and still are conceded necessary for proper boiler construction; it is *sectional—of all steel* construction—built to conform with the A.S.M.E. Boiler Construction Code. A certificate of inspection from a reliable insurance company is furnished with each boiler.

Steeply pitched tubes insure rapid circulation. Baffled for three passes, insuring the proper mixture and distribution of the gases of combustion and resulting in low exit gas temperatures. Each section individually suspended taking care of its own expansion and contraction. Practically all mechanical work on Springfield boilers is performed in our well equipped

plant prior to shipment, thus requiring a minimum of mechanical work in the field for their erection.

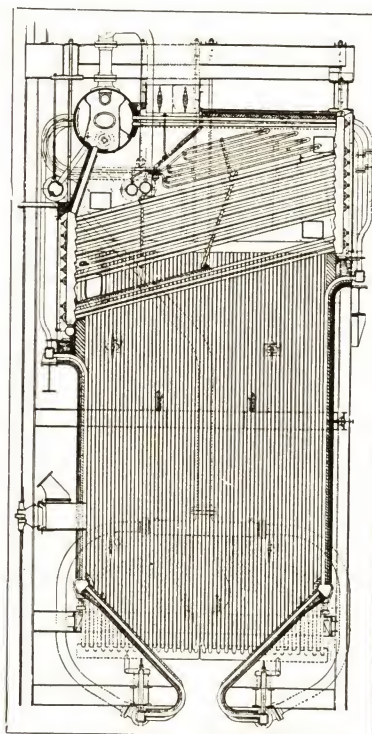
In addition, in this boiler *each* handhole covers *four* tubes, thus lessening the number of handholes by at *least two-thirds* of those required by other boilers.

This boiler is readily adapted to the use of all fuels and methods of firing. There are many other reasons why you should investigate this boiler and be convinced by the experience of others.

The largest power users and leading engineers of the United States are installing "SPRINGFIELD" Boilers and water walls.

Built in all sizes and for all working pressures.

Repeat orders constitute the largest part of our business.



One of the Units, Each Designed to Generate 140,000 Lbs. of Steam per Hour at 500 Lbs. Pressure at the Anheuser-Busch, Inc., Plant, St. Louis, Mo. Ophuls & Hill, Inc., New York City, Engineers

### SPRINGFIELD WATER WALLS:

Being pioneers in the design and development of water cooled furnaces they embody, as far as possible, the same materials and methods of construction as employed in the manufacture of our Water Tube Boiler. They are built in sections or panels wherever possible and assembled and tested in the shop and shipped as a complete unit. These Water Walls are designed to suit the particular furnace design and working pressure for which they are to be used, and walls are built with wide tube spacing or with the tubes so closely spaced that they actually touch.

The feeder and riser connections from the boiler to the water walls are proportioned to supply the steam generating surface with an abundance of water without interfering or disturbing the water level of the boiler.

### UNIT RESPONSIBILITY:

*We are prepared to furnish and accept entire responsibility on complete unit installations of steam generating equipment. The purchaser may make his own selection of all auxiliary equipment.*

### CATALOG AND SERVICE:

Send for copy of our catalog and consult freely with our staff of experienced engineers.



# THE C. E. SQUIRES COMPANY

E. 40TH ST. AND KELLEY AVE., CLEVELAND, OHIO

*Manufacturers of the Genuine Squires Steam Specialties*

## PRODUCTS:

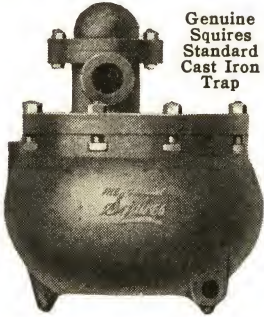
Steam, Air, Blast and Gasoline Traps, Reducing Valves, Pump Governors, Boiler Feed Water Controllers and Gas Regulating Valves for steam boilers.



## "GENUINE SQUIRES" STEAM TRAPS:

Genuine Squires Steam Traps are for use in removing the water of condensation from steam pipes, steam separators, heaters, coils, stills, engine cylinders, receivers, etc., in high pressure power plants, marine service, on low pressure heating systems, laundry machinery, steam separators, vulcanizers in rubber plants, dry kilns, drying rolls of paper machines, unit heaters, etc. They are blast traps; also remove condensation from compressed air lines.

Genuine Squires Standard Cast Iron Trap



The design and construction of these traps are based on 30 years of experience in manufacturing steam specialties, and include several distinctive features:

**Convenience:** Two outlets and two blow-off connectors are provided, permitting pipe connections to be made on either side. Simply lifting a cap gives access to working parts without breaking any pipe connections.

**Positive Action:** The valve is either tightly closed or wide open, thus preventing wire-drawing on the valve and seat. The trap will discharge the water of condensation to any height corresponding with the steam pressure, 1 lb. of pressure being necessary for every 27 in. of lift desired. It will also discharge against any pressure less than the pressure at the trap.

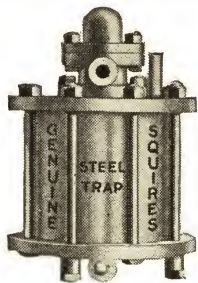
**Durability:** All joints are above the water line and exposed to the temperature of steam only, therefore not being subject to corrosion or unequal expansion and contraction that would affect a partially submerged joint. The hinging of the cast iron bucket is tapered to open bronze bearings and cannot be affected by corrosion or accumulation of solids. There are no floats, levers or joints to fill with dirt, the valve cannot become displaced and there is no stem to pack. All parts are made of the best metal obtainable and suitable for their service, as determined by our long experience.

**Capacity:** All surplus weight of the bucket is transferred to the extreme end giving it a greater pulling force and increasing the capacity of the trap. Seat orifices are large for the size pipe connections, giving the traps far greater capacities than other makes with corresponding pipe connections. A special double valve mechanism can be furnished to take care of specially heavy condensation such as may be due to slugs of water from the boilers or excessive header condensation in large steam plants, but the standard valve mechanism is recommended for usual service.

**Sizes and Construction:** Genuine Squires Steam Traps are built in 9 sizes for

a range of pipe connections from  $\frac{3}{8}$  in. to 4 in. and to handle from 400 to 28,000 lbs. water per hour.

The standard construction includes cast iron housing, but for high pressures and superheated steam, heavy steel boiler plate and heavy pipe construction is used to assure ample strength. The standard construction can also be furnished in cast steel.



High Pressure Steel Trap

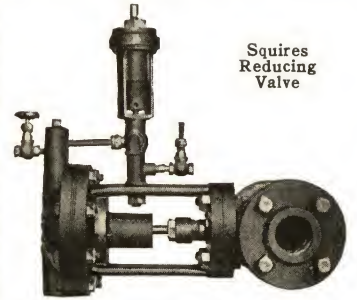
## SQUIRES REDUCING VALVE:

The Squires Reducing Valve will reduce from any boiler pressure to any lower pressure in one reduction. It is built in all standard pipe sizes from  $1\frac{1}{4}$  in. up to 12 in. and can be installed on either vertical or horizontal lines.

This valve is simple in construction, easy of access and dependable in action. The wearing parts are reduced to a minimum. The valve seats and discs are accessible and removable without removing the body of the valve from the line by simply removing the yoke. The delivery pressure is independent of the high pressure side, as the valve is controlled by a pilot valve which is governed by the low pressure side. When desired, the valve can be made to remain wide open, or to go back into action, by simply operating the inlet valve to the pilot and the release valve on the diaphragm chamber.

It will reduce from any pressure as high as 500 lbs. down to atmosphere in one reduction and maintain a steady pressure on the low pressure side regardless of the fluctuation of the high pressure. *It is a dead end valve and can be thermostatically operated.*

Squires Reducing Valve



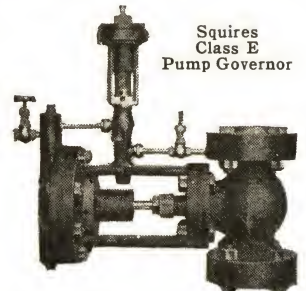
## SQUIRES PUMP GOVERNORS:

The Squires Class "E" Pump Governor is simple in construction, easy of access to the working parts and will fulfill any and all conditions required of a pump governor. The wearing parts are reduced to a minimum. Valve Seats and Discs are removable and are accessible without removing body of valve from line by simply removing yoke, and permit by-passing and operations at wide open position if desired. Positively insures against danger of non-closing. It is made in a range of seven sizes from  $1\frac{1}{4}$  in. to 4 in.

With the Squires Class "B" Excess Pump Governor a fixed excess pump pressure is maintained over fluctuations in boiler pressure by means of an adjustable tension spring which acts with the pump pressure to balance the boiler pressure. This type of governor is particularly adapted to high pressure power plants and marine service where there may be a large variation of steam pressure, and is also very efficient in connection with hand regulation on the boilers.

The Class "H" Pump Governor is regulated by its own action upon the diaphragm. It will maintain a uniform pressure for boiler feeding, circulating pumps, tank pumps and wherever a uniform pressure is desired. Made in six sizes from  $\frac{3}{4}$  in. to  $2\frac{1}{2}$  in.

Squires Class E Pump Governor

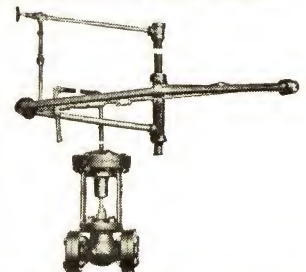


## SQUIRES BOILER FEED WATER CONTROLLER:

This device gives perfect regulation as it utilizes the boiler pressure to control the feed valve, making its operation direct and positive.

The controller is installed so that a series of diagonal copper tubes are centered at the water line of the boiler drum. As the height of the water in the drum rises and falls, the copper tubes are correspondingly contracted and expanded through the variations in their temperature as they contain less or more steam, and this change in length operates to vary the position of a thermal valve which controls the admission of steam at boiler pressure to the diaphragm of the feed valve.

These controllers are made in  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$  and 3 in. sizes.





# STEEL AND TUBES, INC.

224 EAST 131ST STREET, CLEVELAND, OHIO

*Manufacturers of Electrically Welded Tubing*  
A Unit of REPUBLIC STEEL CORPORATION

## PRODUCTS:

**BOILER TUBES:** Electrunit Boiler Tubes of steel or Toncan Iron.

**CONDENSER TUBES:** Electrunit Condenser Tubes of steel, Toncan Iron and other ferrous alloys.

**CONDUIT:** Electrunit Steeltubes Threadless Rigid Conduit.

**MECHANICAL TUBING.**

**STAINLESS STEEL TUBING:** of Enduro Stainless Steel. STAMPINGS.

**STRUCTURAL TUBING:** of rail carbon steel.

## ELECTRUNITE BOILER TUBES:



A modern type of boiler tube of open hearth steel, nickel steel, copper bearing steel, or rust-resisting Toncan Iron, made by electrical resistance welding under the Johnston patents owned by Steel and Tubes, Inc.—a proved process by which

more than a billion feet of tubing has been made for countless purposes during the past years.

Because Electrunit Boiler Tubes are made from clean, flat strip steel, formed cold to a perfect round, they possess a uniformity in diameter, wall thickness and concentricity not attained in tubes made by other processes.

Due to the mechanically controlled electrical resistance method employed in welding, the weld is as strong as the wall. Tubes are full-normalized, soft, ductile and of uniform grain structure. Every tube is tested at pressures far in excess of code requirements. Electrunit Boiler Tubes, because of these qualities, make possible tighter joints with worth-while savings in time and labor. Users report savings of 15 to 20 per cent in installation costs. Meet requirements of A.S.M.E.; U. S. Department of Commerce, Steamboat Inspection Service; American Bureau of Shipping.

Electrunit Boiler Tubes can be used in either fire-tube or water-tube boilers requiring either straight or bent tubes.

Electrunit Boiler Tubes are carried in stock in Cleveland by Steel and Tubes, Inc., and by distributors in many cities. *Write for literature.*

## ELECTRUNITE CONDENSER TUBES:

Soft, ductile tubes—made by the same process as Electrunit Boiler Tubes—which roll into the tube sheet with surprising ease and tightness. Perfectly round; diameter and wall thickness are absolutely uniform; working stresses in the metal are not present; free from scale inside and outside. Ideal for service in condensers, heat exchangers, evaporators, air preheaters and heat transfer equipment of every kind. Made of carbon steel, rust-resisting Toncan Iron and Enduro Stainless Steel in sizes  $\frac{3}{16}$  to 5 inch outside diameter and up to .300 inch wall thickness. *Write for literature.*

## ELECTRUNITE STEELTUBES CONDUIT:



Electrunit Steel-tubes is well known to the electrical wiring industry. For several years, this electric resistance welded electrical metallic tubing

has found favor because of its lighter weight, its elimination of threading, its ease of cutting, bending and re-bending, and its speed of installation. Three simple fittings adapt it to any job. A recent improvement in design—a new knurled inside surface—reduces wire pulling effort approximately 30%. Cable is lifted away from the wall of the conduit, and rides on the tops of tiny rounded knobs shaped like ball bearings. Steeltubes offers full electrical and mechanical protection. It is approved by the National Electrical Code and for Government work. It may be used for all open and concealed work (except in cinder fill), for service conductors on exterior building walls and entering buildings, for voltages up to 600, and with conductors up to No. 4. Stocked by leading jobbers. *Write for literature.*

## MECHANICAL TUBING:

Electrically welded steel tubing for all structural and mechanical purposes in open hearth steel, copper bearing steel, special alloy steel and Toncan Iron—the ferrous alloy of refined iron, copper and molybdenum with rust resistance, among the ferrous metals, second only to the stainless alloys. Round, square, rectangular, hexagonal, helical, oval and ornamental shapes.

Adaptable to annealing, swaging, flattening, bending, punching and drilling. Can be furnished with ends flared or upset, turned in or out, conical, tapered, twisted or beaded, and cut off at any angle or length. Bent or formed to any shape. In 3 to 22 gauge— $\frac{3}{16}$  to 5 inch outside diameter. *Write for Handbook of Electric Weld Tubing.*

## STRUCTURAL TUBING:

Made of selected first quality rail carbon steel by the electrical resistance welding process. For use where maximum strength and rigidity with minimum weight are required. Available in numerous standard sizes and wall thicknesses. In round, square, rectangular, oval and special shapes. *Write for literature.*

## STAINLESS TUBING:

Embodying all the advantages of ENDURO, Republic's Perfected Stainless Steel (see page 176), and the features of tubing electrically welded by the Johnston process. For use where corrosion is a major factor or resistance to scaling under high temperatures is required. In 14 to 22 gauge— $\frac{3}{16}$  to 3 inch outside diameter. *Write for information.*

## SHEET METAL STAMPINGS:

Light, medium and heavy. In all metals. Let us submit prices and suggestions on your samples, drawings or specifications.



# B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

400 No. Michigan Ave., CHICAGO, ILL.

681 Market St., SAN FRANCISCO, CAL.

*Heating, Ventilating, Air Conditioning, Vacuum Cleaning and Mechanical Draft Equipment*

## SALES ENGINEERING OFFICES

ATLANTA, GA.  
BALTIMORE, MD.  
BOSTON, MASS.  
CAMDEN, N. J.  
CHICAGO, ILL.

CINCINNATI, OHIO  
CLEVELAND, OHIO  
DALLAS, TEX.  
DENVER, COLO.

DETROIT, MICH.  
GREENSBORO, N. C.  
HARTFORD, CONN.  
INDIANAPOLIS, IND.

KANSAS CITY, MO.  
LOS ANGELES, CAL.  
MILWAUKEE, WIS.  
NEWARK, N. J.

NEW YORK, N. Y.  
PITTSBURGH, PA.  
PORTLAND, ORE.  
ROCHESTER, N. Y.

ST. LOUIS, MO.  
SAN FRANCISCO, CAL.  
SEATTLE, WASH.  
ST. PAUL, MINN.  
WASHINGTON, D. C.

CANADIAN OFFICES: GALT, ONT.; MONTREAL, QUE.; TORONTO, ONT.

CANADIAN REPRESENTATIVE: KIPP KELLY, LTD., WINNIPEG, MAN.

COOLING AND AIR CONDITIONING CORP., a division of B. F. Sturtevant Co., is organized for engineering and installing complete Industrial Air Conditioning Systems. OFFICES at HYDE PARK, BOSTON, MASS.; NEW YORK; CHICAGO; CAMDEN; ATLANTA; LOS ANGELES

## AIR CONDITIONING EQUIPMENT



Central System

Systems include fans, air washers, heaters, automatic controls, duct work and all allied equipment necessary for positive maintenance of desired temperature and humidity conditions.

The Cooling and Air Conditioning Corporation, subsidiary of B. F.

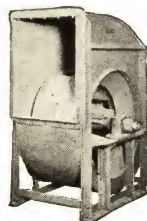


Sectional Humidifier

## CENTRIFUGAL FANS

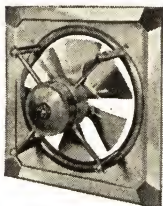
Made in a wide variety of types and sizes for exhauster or blower service. Belt, motor, or turbine driven.

Upon receipt of your advice as to service conditions to be met, our engineers would be glad to recommend a Sturtevant Centrifugal Fan exactly suited to your particular needs.



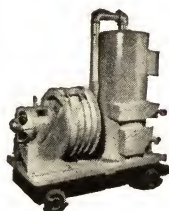
## PROPELLER FANS

The Sturtevant Design 7 Propeller Fan shown, with pressed steel ring, is made in wheel diameters from 12 in. to 25 in. Furnished with or without furniture steel mounting panel. Wheel diameters from 30" to 45", inclusive, available in Sturtevant Design 5 Propeller Fan with cast iron ring.



## VACUUM CLEANERS

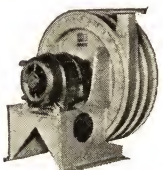
Made in portable and central system types for every vacuum cleaning need in industrial plants, hotels, hospitals, schools, public buildings and other places.



## CENTRIFUGAL COMPRESSORS

Design No. 9 shown is exceptionally well suited for industrial furnace, conveying and pneumatic tube work. It will deliver a comparatively wide range in air volumes at an almost constant pressure.

Pressures: from 1/2 to 10 pounds. Volumes: from 50 cubic feet to 50,000.



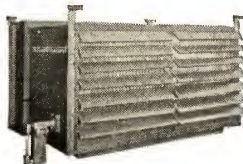
# Sturtevant

REG. U. S. PAT. OFF.



Available in central system and unit types for every air conditioning requirement, whether for comfort or industrial processing purposes. Can be furnished as complete systems or as individual pieces of equipment.

Sturtevant Central Air Conditioning



Suspended Type

Sturtevant Company, engineers and installs complete air conditioning systems for industrial processing purposes. This company makes available the advantages of Sturtevant's 20 years of experience as a pioneer in industrial air conditioning.

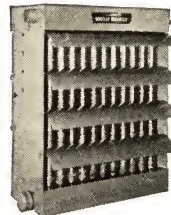
## UNIT HEATERS

**Rexvane Type:** For floor, wall or ceiling installation.

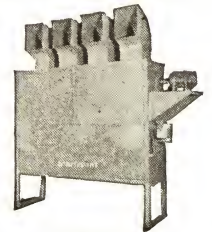
**Cabinet Type:** Is commonly used in offices and other places where relatively quiet operation is desired.

**Suspended Type "Speed Heater":** For wall or ceiling installation. Handy malleable iron hangers supplied with each heater.

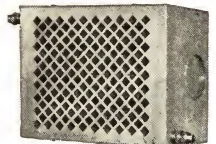
**General:** All models of Sturtevant Unit Heaters are equipped with fin type heating elements guaranteed for all steam pressures up to 200 lbs. per square inch. Capacities: up to 1,000,000 B.T.U. Motors: both alternating and direct current and for standard voltages.



Suspended Type



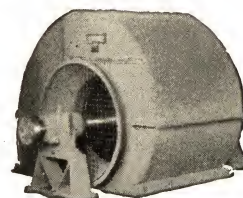
Rexvane Type



Cabinet Type

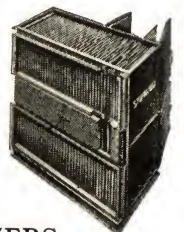
## MECHANICAL DRAFT FANS

Made in both forced and induced draft types to meet any speed, pressure, volume or temperature requirements. Can be furnished complete with Sturtevant reduction gears and Sturtevant steam turbine, motor or engine drive, thus insuring fixed responsibility for the complete unit.



## AIR HEATERS

Made in plate and tubular types. The plate type shown has readily removable and reversible chambers. Should the "cold" ends of these chambers corrode because of sulphur or other corrosive agents in the flue gases, the chambers can be reversed and put into service again.



## FUEL ECONOMIZERS

The Sturtevant Cast Iron Economizer Shown is distinguished by tapered metal-to-metal joints throughout. The higher the pressure goes the tighter the joints become. Leakage that commonly accompanies all gasket joints is eliminated.

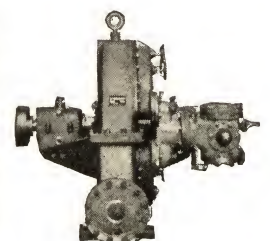
For the higher pressures steel tubes are used and are lead coated to resist corrosion.



## STEAM TURBINES

Design 12 is a single-stage multi-velocity power unit of high efficiency. Especially adapted for variable speed auxiliary service in driving fans, blowers, centrifugal pumps, generators, etc.

Design 14 is for extremely high steam pressure and superheat, and for back pressures exceeding 100 lbs. Can be provided with automatic nozzle control.





# SULLIVAN MACHINERY COMPANY

Established 1851

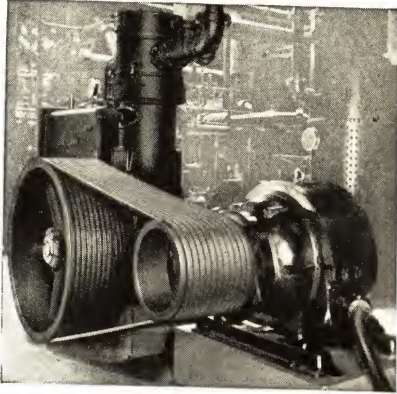
402 N. MICHIGAN AVE., CHICAGO, ILL.

WORKS: CLAREMONT, N. H., AND MICHIGAN CITY, IND.

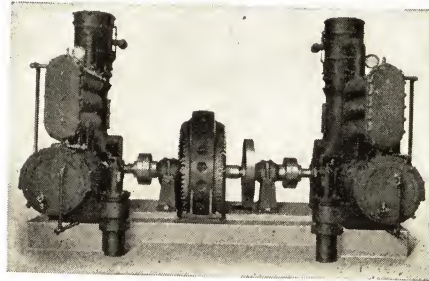
## SULLIVAN ANGLE COMPOUND COMPRESSORS

Sullivan stationary compressors of the Angle Compound design provide balanced reciprocating forces which eliminate vibration, give low power cost, reduced floor space and low foundation cost. They have an unequalled

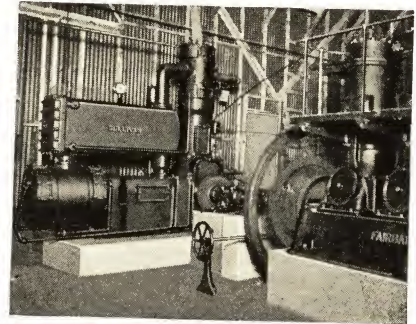
reputation for endurance. Sizes 348 to 6700 cu. ft. Positive, automatic lubrication; 3-pass counterflow copper intercoolers. Modern capacity control. Drive by V-belt, flat belt or direct connection to electric motor or diesel engine. *Bulletin 88-A.*



Angle with "V" Belt Drive



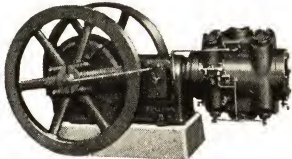
Direct Connected Motor Driven Twin Angle



Diesel Engine Driven Angle Compressor

## SINGLE STAGE BELTED COMPRESSORS

For smaller requirements, "WG-6" belt driven compressors (capacity 68 to 500 cu. ft. per minute) will give dependable and economical service. "WG-6" is equipped with wafer valves, modern capacity control, splash lubrication and total enclosure of all working parts. For flat-belt or V-belt drive. *Bulletin 83-X.*

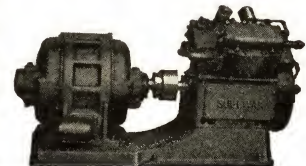


"WG-6" Single Stage Compressor

## VERTICAL COMPRESSORS

One, two and four-cylinder models embody advantages of small floor space, easy portability and automatic or hand control. Drive by flat belt, V-belt or direct connection to motor. Capacities 23 to 350 cu. ft.

*Bulletins 83-T, 88-B, 88-C.*



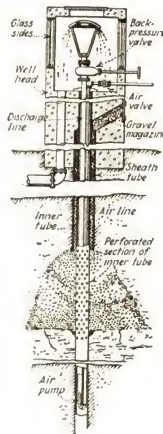
"WL-44" Twin-"V" Direct Connected. 4 Balanced Cylinders

## PORTABLE HOISTS

Sullivan "HA-7" Turbinair hoists weigh 345 lbs., hold 450 ft. of  $\frac{3}{8}$ -in. wire rope and will lift a ton or pull a 50-ton car on 80 lbs. of air. Available in single and two-drum models. Electric hoists are also available in a variety of sizes.



Sullivan Portable Hoist



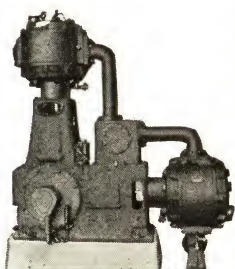
## SULLIVAN AIR LIFT

For low cost water or acid pumping. Is trouble free; no moving parts in well to wear or suffer damage; no possibility of trouble from mud or sand, crooked wells or varying water levels. By means of the Air Made Well, Sullivan air lift makes permanent, shallow wells in sand often saving cost of lifting water from deep rock sources. Any number of pumps may be controlled from one station; automatic control is available. For acid pumping, special non-corroding equipment is furnished. *Bulletins 71-J and 71-K.*

## DRY VACUUM PUMPS

Built in numerous sizes in both horizontal (1 cylinder) and angle (multi-cylinder) types for flat belt, V-belt or direct connected drive.

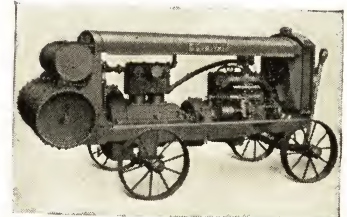
Total enclosure of working parts and automatic positive lubrication.



Angle Vacuum Pump

## PORTABLE COMPRESSORS AND TOOLS

Sullivan Portable Compressors and Sullivan Air Tools will speed up new construction and repair work. The compressors are available in sizes from 72 to 505 cu. ft. Gasoline, distillate or oil engines or electric motors. Steel wheel, trailer truck or skid mountings.

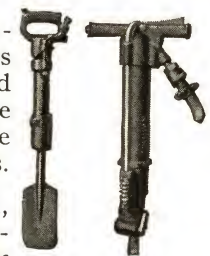


*Bulletin 83-R, Compressors.*

Portable Compressor

Sullivan Concrete Breakers or "Busters" and Clay Spaders are available in a wide variety of models.

*Bulletin 87-A, Spaders. Bulletin 87-G, Concrete Breakers.*



Clay Spader

K-6 Buster



# THE SUPERHEATER COMPANY

60 EAST 42ND ST., NEW YORK, N. Y.  
PEOPLES GAS BUILDING, CHICAGO AMERICAN BANK BUILDING, PITTSBURGH

*Designing Engineers and Manufacturers of ELESKO Superheaters*

## CONTROLLING THE AIR PREHEATER CORPORATION

60 EAST 42ND ST., NEW YORK, N. Y.

*Manufacturers of Ljungström Air Preheaters*

BIRMINGHAM BOSTON CHARLOTTE DENVER KANSAS CITY HOUSTON MEMPHIS NEW ORLEANS  
SALT LAKE CITY SAN FRANCISCO TACOMA

CASSEL-WILHELMSHÖHE, GERMANY—HAVANA—HONOLULU—LONDON—PARIS—SYDNEY, AUSTRALIA

FOR CANADA: THE SUPERHEATER COMPANY, LIMITED, Dominion Square Building, Montreal

### PRODUCTS

The Superheater Company is the world's largest manufacturer of steam superheater equipment. More than one hundred million horsepower have been equipped with Elesco superheaters in locomotive, stationary, marine, and oil-country services.

Other products are: separately-fired superheaters; water-cooled furnace walls; economizers; Ljungström



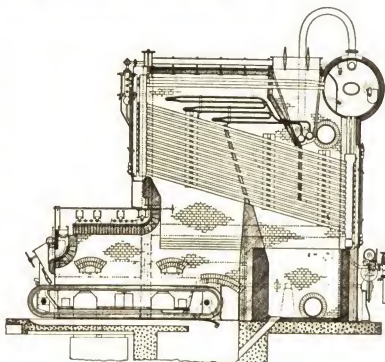
air preheaters; Griffin hot-blast process for cupolas; steam reheaters or resuperheaters; steam desuperheaters; special high-pressure and leakproof pipe coils; rough or finished castings in standard bronzes, aluminum bronzes, and super-tensile manganese bronze; non-sparking tools. Also locomotive feed water heaters and exhaust steam injectors; superheated steam pyrometers; heat exchangers.

### ELESKO SUPERHEATERS FOR STATIONARY SERVICE

Reduce fuel consumption; increase boiler efficiency; reduce steam consumption (15 to 25 per cent in reciprocating units, 10 to 15 per cent in turbines); increase plant capacity; eliminate erosion of turbine blades; reduce steam line condensation.

Elesco superheaters are adaptable to every make, type, and size of stationary boiler. They can be installed in existing boilers without necessitating radical plant changes.

Every Elesco superheater is designed to give the most satisfactory results for individual plant conditions. This involves consideration of existing equipment and conditions peculiar to each individual plant, and requires a basic design and arrangement readily adaptable to these needs.



Convection Type Elesco Superheater  
in a Horizontal Cross Drum Boiler

**Superheaters for Small Boilers:**  
Two standard types of simplified Elesco superheaters are available for all makes of h.r.t. and low-head boilers. They make possible, at exceedingly low cost, full advantages of superheated steam operation. Both superheaters

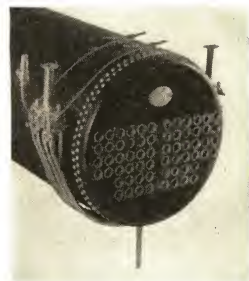


Elesco Forged Return Bend

are automatic in operation and provide for various superheats by location of units.

The Elesco h.r.t. superheater includes two cast-steel headers, one on each side of boiler shell, connected by superheater units which extend around the underside of boiler shell and have detachable metal-to-metal ball joints. This Elesco superheater is easily and quickly applied by plant attendants.

The Elesco superheater for low-head boilers has multiple-loop, single-pass units connected by detachable metal-to-metal ball joints to the header outside the boiler.



New Elesco H. R. T.  
Superheater

### SEPARATELY-FIRED SUPERHEATERS

They are made for process work and for other purposes, for pressures from atmospheric up to 1800 lb. per sq. in. and for temperatures up to 1200 deg. F. Arranged in brick settings for large capacities. Made as portable units with metal casings for small capacities. Features include accessibility, regulation, long life, and high efficiency.

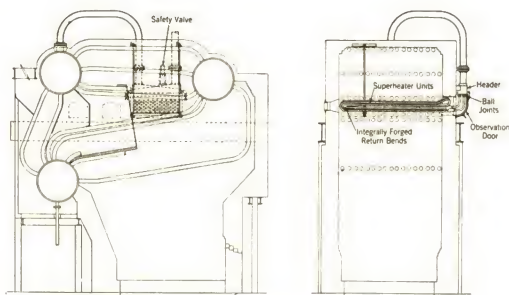
### LJUNGSTRÖM AIR PREHEATERS

They recover heat from flue gases and use it to preheat combustion air. This recovery and return of otherwise wasted heat to the furnace effects substantial fuel savings, improves boiler efficiency, and increases steaming capacity of steam power plants, industrial furnaces, oil stills, etc.

The Ljungström air preheater employs exclusively the continuous regenerative counterflow principle, which assures the highest practical heat recovery (approximately 70 per cent) for combustion air-preheating equipment.

The operating principle is: Flue gas is drawn upward in one vertical half of the casing through a horizontal honeycombed metal rotor and the combustion air is forced downward through the opposite part of the rotor. Continual slow motion of the rotor at the rate of not over 3 r.p.m. carries heat absorbed from the gases around to the other side and the rotor at this point gives up this heat to the combustion air. Rotor is driven by small electric motor through speed reducer. Power consumption is negligible.

**Description of Elesco Superheaters for Stationary Boilers:**  
Elesco superheaters consist generally of: (1) Two headers, one acting as the distributor for the saturated steam coming from the boiler, and the other as a collector for the steam after it has been superheated and from which the steam is carried to the steam main. (2) Multiple-loop units of heavy gage seamless steel tubing, which are formed by bonding together two or more entire lengths of tubing by integrally forged return bends. Units are connected to the headers by clamped metal-to-metal joints. (3) Connecting pipe between the boiler nozzle and the saturated-steam header, outlet flange, safety valve, and drain valves.

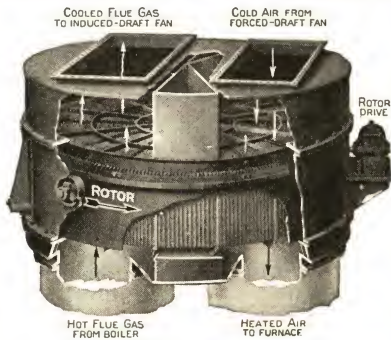


New Elesco Superheater in a Low-head Boiler,  
Showing Multiple-loop, Single-pass Superheater Units



## THE SUPERHEATER COMPANY

Preheated combustion air does as much additional useful work as though the recovered heat it returns to the furnace were obtained from an equivalent additional amount of fuel. The useful heat return represents a savings up to 15 per cent in fuel. Using preheated combustion air also speeds up the combustion rate of the



Type CANX  
Ljungström Air Preheater

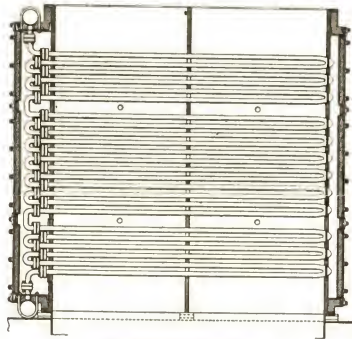
fuel-burning equipment and increases boiler capacity to an extent at least equal to what would be accomplished by burning 10 to 15 per cent more fuel with air of normal temperature.

These benefits apply with stoker firing, pulverized coal, oil, gas, etc. In burning wet wood, experience indicates that preheated air increases the fuel-burning capacity 50 per cent over that obtained with cold air.

### ECONOMIZERS

They comprise a series of Elesco bifurcated bare tubular units with integrally forged return bends contained in a casing with hinged doors at the ends. The Elesco standard construction permits close spacing of economizer tubes, giving highest heat transfer rate, maximum accessibility, minimum number of joints. Built both for natural and induced draft and applicable to all sizes of boilers.

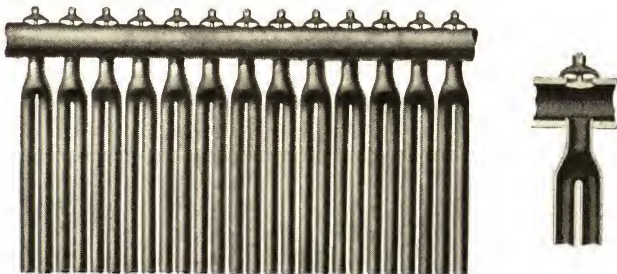
An economizer absorbs heat from exhaust gases and increases the temperature of the feed water. Fuel savings up to 15 per cent are realized and equivalent increases in capacity are obtained. The heat absorbed by an economizer enters the boiler in the feed water, thus unloading the furnace, reducing furnace temperatures, and permitting greater evaporations without increasing furnace maintenance.



Elesco Economizer

### WATER-COOLED FURNACE WALLS

Bare tubing of bifurcated design is used for Elesco water-cooled furnace walls. An Elesco bifurcated tube comprises two tubes integrally forged together at their ends to form a single terminal by means of the same special machine-forging process employed in making Elesco forged return bends.



Elesco Bifurcated Water Wall and Joint Detail

Points of superiority of Elesco water-cooled furnace walls are:

- (1) Maximum heating surface per sq. ft. of wall area.
- (2) Maximum amount of water-touched surface per sq. ft. of furnace wall area.

- (3) Minimum number of joints per sq. ft. of heating surface.
- (4) Simplicity in design with flexibility which permits arrangement of tubes to conform to contour of furnace and setting.

### STEAM REHEATERS OR RESUPERHEATERS

In Elesco designs the latent heat of high-pressure steam is used mainly for reheating or resuperheating steam taken from a low-pressure stage of the turbine. Built in capacities from 20,000 to 1,000,000 lb. steam per hr.

### STEAM DESUPERHEATERS

They reduce the temperature of superheated steam without bringing it in contact with cooling water, thus making it possible (1) to use new higher temperature and pressure boilers in conjunction with existing prime movers and (2) opening up new possibilities in the use of steam for process work and general industrial purposes. Built as single units in capacities from 25,000 to 1,000,000 lb. steam per hr.

### SPECIAL HIGH-PRESSURE AND LEAKPROOF PIPE COILS

Elesco pipe coils are especially designed and manufactured of steel pipe or seamless steel tubing for purposes requiring a seamless leakproof structure, as provided by Elesco integrally forged return bends, such as, for refrigerating coils, heat exchangers, tank car coils, and heat-distributing coils in hot oil circulating systems. The distance between tubes is only  $\frac{1}{8}$  to  $1\frac{1}{8}$  in., therefore, maximum heating or cooling surface can be had within any rectilinear space. Some are in use at as high as 3500 lb. pressure.

### BRONZE CASTINGS

Castings can be furnished, rough or finished, in three types of bronze: (1) Standard bronzes which have considerably higher than average physical properties. (2) Aluminum bronzes with high iron content, which ordinarily give from 5 to 8 times the life of the standard mixes when used as bushings, bearings, gears, and pinions. (3) Super-tensile manganese bronze with a tensile strength of approximately 116,000 lb., which is used largely where extreme strength is required.

### NON-SPARKING TOOLS

A complete line of non-sparking tools is made for use in oil plants, powder plants, etc., where steel tools may spark and cause explosions.

### LITERATURE

Stationary Superheaters—*Bulletin AAT-1*. Also descriptive bulletins on superheaters for principal makes of boilers, h.r.t. boilers, oil-country boilers, and steam shovels.

Ljungström Air Preheaters—*Bulletin AA-332*.

Bronze Castings—*Bulletin AAB-2*.

*Superheat Engineering Data*—A handbook on the generation and use of superheated steam and related subjects—273 pages; price \$1.00.

Other descriptive literature is available on Griffin hot-blast for cupolas, Elesco superheaters for locomotive and marine services, Ljungström air preheaters for marine service, and other Elesco equipment.

Without obligation we shall gladly furnish preliminary drawings and estimates of costs and possible savings obtainable through the installation of Elesco superheaters and other equipment in new and existing plants.

(A-878)



# SUN OIL COMPANY

PHILADELPHIA, PENNA.

*Manufacturers of Petroleum Products*

## SALES OFFICES

AKRON	BEAUMONT	COLUMBUS	FLINT	JACKSONVILLE	PHILADELPHIA	SCRANTON-WILKES-BARRE
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SUN OIL CO., LTD., MONTREAL AND TORONTO

*Subsidiary Companies:*

SUN CO., TULSA

BRITISH SUN OIL CO., LTD., LONDON, ENG.

## REFINERS OF LONG EXPERIENCE:

The Sun Oil Company's full line of petroleum products is backed by the knowledge and experience gained in forty-eight years of careful refining and vigorous commercial growth. This organization has long been known widely and favorably as a most dependable source of supply. Of particular interest are:

### BLUE SUNOCO MOTOR FUEL:

Blue Sunoco, an outstanding success among motor fuels, is favored by truck operators and motorists alike. It gives high test performance, plus knockless power, but sells at regular gas price.

### SUNOCO "MERCURY MADE" MOTOR OIL:

Sunoco "Mercury Made" Motor Oil used with Blue Sunoco provides an ideal combination. It is the only motor oil made by the "Mercury Process" of refining . . . the result is a lubricant in which are combined more advantages than ever before offered in one oil. Long lasting, leaves no hard carbon, gives surprising mileage.

### INDUSTRIAL OILS AND GREASES:

The Company's lubricating oils and greases can be depended on for genuine efficiency and have long enjoyed an enviable reputation. The industrial line includes lubricants for all factory equipment, from the smallest to the largest machines. Wide usage in many industries is daily proving the worth of these oils and greases, and attests to the fact that they conform to highest standards of excellence.

### SUNOCO TURBINE OILS:

Sunoco Turbine Oils are noted for their remarkable uniformity and stability. With these oils, the development of sludge and acidity is minimized. Under observation, over long periods of service in large turbines, the viscosity changes have been consistently very slight.

# SUNOCO



TRADE-MARKS

## SOLNUS OILS FOR DIESEL ENGINES:

The Sun Oil Company, as shipbuilder, ship operator and refiner, has long been in an extremely favorable and coordinated position for developing lubricants for Diesel engines. The result is seen in the excellence of the highly recommended Solnus Oils for this purpose. These oils have the proper viscosities and possess the very desirable characteristics of minimum amount of carbon and low consumption consistent with complete and efficient lubrication.

## DIESEL FUELS AND FUELS FOR OTHER INDUSTRIAL PURPOSES:

This organization specializes in the refining of fuel oils for Diesel engines of all types (light, high speed, heavy duty, etc.) and fuel oils for all other industrial purposes. The sustained demand for these petroleum fuels indicates their high quality and uniformity.

## CUTTING OIL:

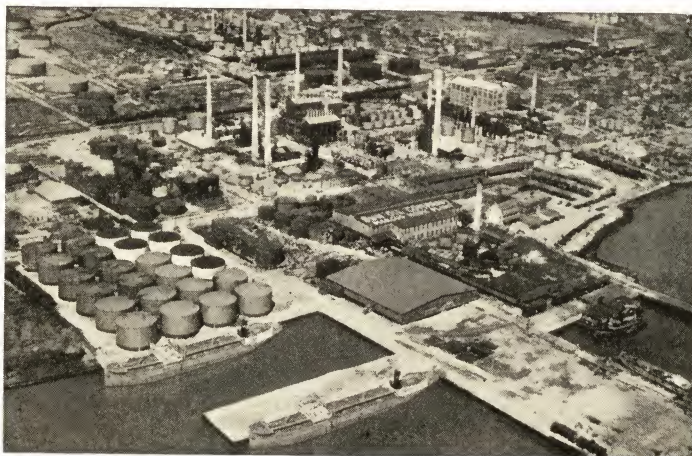
Sunoco Emulsifying Cutting Oil is an all-mineral product, and is self emulsifying. It mixes readily with hard or soft water and does not become rancid. With its use, speeds may be increased safely for increased production, with accuracy and finish maintained.

## SPECIAL PROCESS OILS:

Practically all types of special process oils are included in the Sun Oil line. Oils for heat-treating, quenching, tempering, for rust prevention, rubber processes, cordage manufacture, for insulation and a host of many other special uses are offered.

## INSPECTION AND RECOMMENDATION SERVICE:

This Company offers you the thorough co-operation of a representative from its staff of lubricating engineers. He will consult with you, study your equipment and make specific recommendations for the proper lubricants and methods of using them. This service is free; industrial concerns in large numbers have benefited through following the recommendations of these skilled engineers.



The Sun Oil Company Refinery at Marcus Hook, Pennsylvania.  
Other Sun Refineries Are Located at  
Toledo, Ohio, and Yale, Oklahoma



# THE SWARTWOUT COMPANY

18537 EUCLID AVENUE, CLEVELAND, OHIO

## LIQUID LEVEL CONTROL

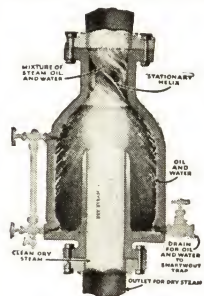
The Swartwout Water Level Control Valve at the right is a cushioned, hydraulically operated valve. It is, however, only one of the many pieces of Swartwout equipment devoted to liquid level control.

Swartwout equipment embraces means for controlling levels in open tanks, pressure tanks, elevated standpipes, and heaters; controlling pumps and supply and overflow valves, in any desired manner.

Write for detailed information.

## SEPARATORS

Swartwout Separators, employing centrifugal force, are adapted to the separation of any liquid from any vapor or gas. They range in size from the huge catchall type separator used in the sugar industry, down to the small outlet type which is installed just ahead of a small pneumatic tool.



Made for all pressures, and of all commercial materials.

Write for detailed information.

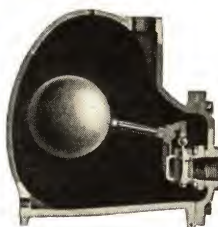
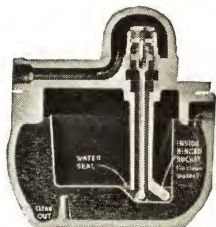
## EXHAUST HEADS

Swartwout Cast Iron Exhaust Heads are light in weight, of ornamental appearance, and last a lifetime. They employ centrifugal force, which thoroughly separates the water and oil from the steam with a minimum of back pressure.

Write for detailed information.



## TRAPS—CONDENSATE CONTROL



Swartwout offers a complete line of equipment for the control of condensate. First come the simple and conventional types of traps—open bucket, inverted bucket, and low pressure float type—each with many individual features. Then the more elaborate boiler return and lifting traps. Finally, specialized equipment for the handling of unusually large quantities of condensate from evaporators, cookers, and the like and for the draining of condensate at exceptionally high pressures.

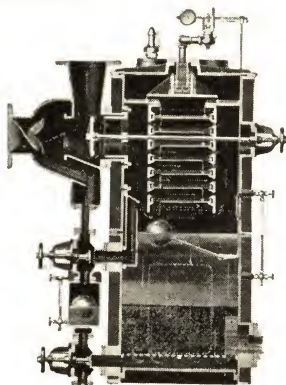
Write for detailed information.

## FEED WATER HEATERS

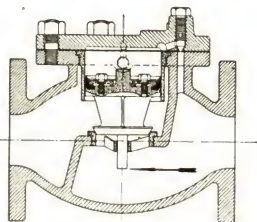
Swartwout open type feed water heaters are complete with all the usual features and many that are not usually included. They are built in many special styles to fit particular requirements, such as extra water storage; and can be easily enlarged as plant requirements for hot water increase.

Deaerating heaters are provided with vent condensers and special deaerating features which reduce the oxygen content of the heated water to the lowest practical value.

Write for detailed information.



## POWER PLANT EQUIPMENT Swartwout



## FEED WATER REGULATORS AND PUMP CONTROL

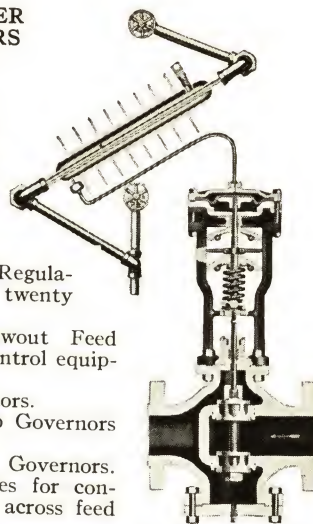
"S-C" Feed Water Regulators are today serving the largest and highest pressure central station boilers, and giving equal satisfaction in the smallest low pressure industrial plant.

The present simple, powerful, and reliable "S-C" Feed Water Regulator is the result of more than twenty years' practical experience.

The Complete Line: Swartwout Feed Water Regulation and Pump Control equipment includes:

- "S-C" Feed Water Regulators.
- Differential Pressure Pump Governors without stuffing boxes.
- Constant Pressure Pump Governors.
- Differential Pressure Valves for controlling the pressure drop across feed water regulators.
- Interlocking Master Controlled Pump Control Valves to automatically start or stop pumps as required.

Write for detailed information.

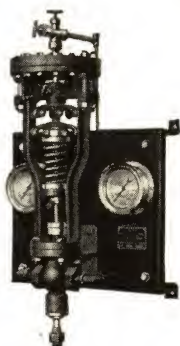


## PRESSURE REGULATORS

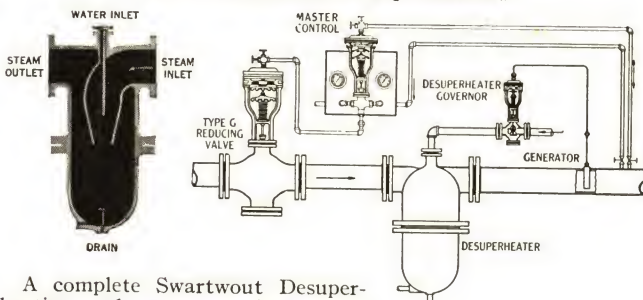
The "S-C" Master Control shown at the left is essentially an amplifier of pressure variations. It provides the basic method of pressure control in Swartwout systems. With it, effective control is provided for:

- Single reducing valves;
- Groups of valves;
- Several valves operating progressively in parallel to handle wide load fluctuations;
- Combinations of reducing and relief valves;
- Motor rheostats;
- Operating cylinders;
- High pressure drops in a single step.

Write for detailed information.



## DESUPERHEATING EQUIPMENT



A complete Swartwout Desuperheating and pressure reducing station is shown. The desuperheater itself is of the direct contact "carburetor type," and handles a wide range in load variation with uniform discharge temperatures. An important part of the desuperheating station is the "S-C" desuperheater governor, which is built in a variety of forms for the control of all temperatures encountered in practice.

Master controlled pressure reduction can be combined with the station, as indicated in the diagram. Not only that, but any desired safety features can be incorporated to automatically protect the low side of the system from failure in cooling water, ruptured pipes, or other accidents.

Write for detailed information.

## INDUSTRIAL VENTILATION

If you are interested in the removal of stale air, odors, fumes, smoke or vapors for assuring increased worker efficiency, write for full information on the Swartwout Rotary Bronze Ball Bearing Ventilator.

If your problem is reducing high temperatures prevalent in your buildings—send for full information on the new Dexter Heat Valve.



# TAYLOR INSTRUMENT COMPANIES

ROCHESTER, N. Y.

*Manufacturers of Instruments for Indicating, Recording or Controlling  
Temperature, Pressure, Liquid Flow and Level*

## SALES OFFICES

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MINNEAPOLIS, MINN. . . . . 550 Sexton Bldg.

IN CANADA: TAYLOR INSTRUMENT COMPANIES OF CANADA, LTD., 110 Church St., Toronto, Ontario

MANUFACTURERS' DISTRIBUTORS IN GREAT BRITAIN: SHORT & MASON, LTD., London, Eng., E. 17

## TAYLOR INDUSTRIAL THERMOMETERS

Made in straight (Fig. 1), angle, long-stem and handled forms (Fig. 2). Fixed-connection type is for permanent installation on pipe lines and apparatus. Long-stem type is for use on open tanks and kettles.

Temperature ranges, stem lengths, types of connection etc., to suit specific applications.

## TAYLOR RECORDING THERMOMETERS AND RECORDING PRESSURE GAUGES

Every variation of temperature or pressure is automatically charted by these recording instruments (Fig. 3), furnishing a check on efficiency of apparatus and employees.

Available as mercury-, vapor-, or gas-actuated: with one, two or three pens; and with suitable form of bulb and connection for every application.

**Accuratus Tubing:** Mercury-actuated recorders are available with Taylor Accuratus Tubing, which compensates automatically for any changes of temperature around it. Tubing may pass over steam pipes or refrigerated coils; it may run out-of-doors and be subjected to all kinds of weather, without affecting accuracy of temperature records. Taylor Accuratus Tubing is by far the most satisfactory compensated tubing ever offered.

## TAYLOR DIAL THERMOMETERS AND GAUGES

Operate on the same principle as the recording instruments described above, but do not furnish a chart record. A pointer indicates on the dial (Fig. 4) the degree of temperature or pressure.

In appearance they resemble a large steam gauge, and are easy to read, even from a considerable distance.

Available with mercury-, vapor-, or gas-actuated systems, and with form of bulb and connection suited to any application.



## TAYLOR TEMPERATURE AND PRESSURE CONTROLLERS

**"Type P" Expansion-Stem Temperature Controllers** (Fig. 5) are used when the point of attachment is accessible for inspecting and setting, and where there is sufficient room inside apparatus to accommodate the 12-inch rigid stem. Motive power is compressed air.

**Self-Acting Temperature Controllers** (Fig. 6) are for use where compressed air is not available, and where control within close limits is not essential. Used on hot-water service tanks, pea blanchers, hog-scalding tanks, ham-boiling vats, bottle and can washers, etc.

**Fulscope Controllers for Temperature, Pressure, Rate-of-Flow and Liquid Level** (Fig. 7) are ideal where close control and quick change of control point are necessary. These instruments embody the latest features in control mechanisms, including the Taylor Sensitivity Adjuster, an outstanding development. For especially difficult control jobs, we recommend this instrument with the Taylor Dubl-Response Unit. Write for information.

## TAYLOR PYROMETERS

The Indicating Wall-Type Pyrometer (Fig. 8) is an accurate, durable instrument, in dust- and -moisture-proof aluminum case.

Recording Pyrometers (Fig. 9) are available in either single- or double-record type.

For complete data on these or any other Taylor Instruments or for help on any specific temperature, pressure or flow control problem write TAYLOR INSTRUMENT COMPANIES, Rochester, N. Y., or the nearest Taylor Sales office.



Fig. 1  
Straight Thermometer



Fig. 2  
Handled Thermometer



Fig. 3  
Recording Thermometer

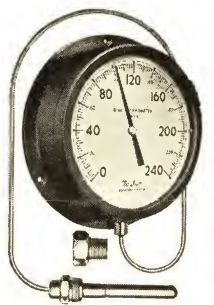


Fig. 4  
Dial Thermometer

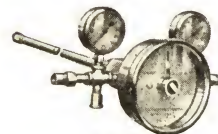


Fig. 5  
"Type P" Controller

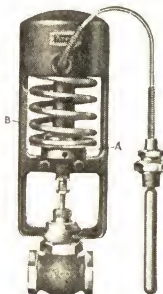


Fig. 6  
Self-Acting Controller

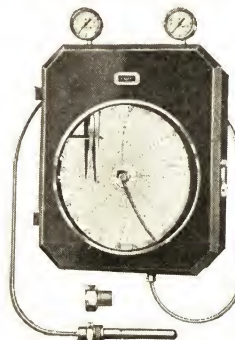


Fig. 7  
Fulscope Controller



Fig. 8  
Wall-Type Indicating Thermometer



Fig. 9  
Pyrometer Recorder



# TEMPLETON BROTHERS, INC.

189 BELGRADE AVENUE, ROSLINDALE STATION, BOSTON, MASS.

*Manufacturers of the Templeton Improved Return Traps for Boiler Feeding and Pumping*

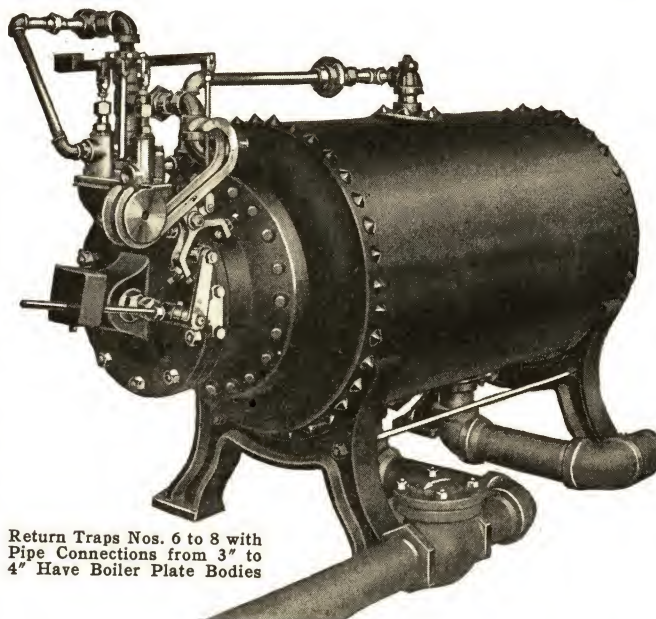
## THE TEMPLETON IMPROVED RETURN TRAP:

Steam plant economy is always a subject of vital importance to owners and operators, and it has become an economic necessity to take advantage of every opportunity to reduce the rising operating expenses and high fuel cost. The return trap has come to be recognized by engineers as having an economic value in the handling of hot water, and the wide range of its application has made it preferable to a pump, due to the fact that the return trap will handle water or any other liquid regardless of temperature.

Our slogan is "We handle any volume of temperature at any pressure—that means we make return traps specially to fit conditions."

**Construction:** For pumping and boiler feeding, draining heaters and vacuum lines and creating vacuum on low pressure return lines. Constructed mechanically perfect, up to date in design, and operation reliable. Workmanship and materials used place it in a class of the highest standard. Its rating is not overestimated and it will discharge the full rated contents each operation, making it efficient in steam consumption.

**Distinctive Features:** Templeton Return Traps cause no jar and shock absorbers are not required. 85% of the contents of the trap body is discharged at each operation. Valves are made of Phosphor Bronze metal and the seats and discs are renewable. The trap will receive condensation regardless of the temperature. It will consume very little steam. Pressure is admitted to the surface of the water in trap and is automatically shut off before the trap is empty. Valves can be adjusted so that the trap is filled to top and emptied to bottom thus insuring maximum discharge per cycle. The gage glass on the trap shows at a glance how quickly the trap is filling or emptying. The trap has an open float which is a patented feature and prevents bursting or waterlogging. It has no trunnions and has only one small stuffing box which



Return Traps Nos. 6 to 8 with Pipe Connections from 3" to 4" Have Boiler Plate Bodies

will not bind. There is only one flange so that the cover can be removed without breaking pipe connections. Valves are operated by the roller weight and not by float, and open and close quickly so they will not wire-draw. Templeton Trap has the most simple and positive valve action which is also a patented feature.

**Capacity:** There is an important fact to keep in mind when buying steam traps. Traps are purchased to handle condensation and should be bought for capacity and not by pipe size. Avoid trap complaint and trouble by purchasing them on a capacity basis as you do your boilers, engines, motors, etc.

### CAPACITIES TEMPLETON RETURN TRAPS (GUARANTEED)

Trap No.	Size of Water Inlet and Outlet	Lbs. of Water Each Discharge or Dump	Lbs. of Water Per Hour Trap Will Discharge	Lineal Ft. of 1" Pipe Radiation Trap Will Drain	Square Ft. of Radiation Trap Will Drain	Boiler H.P. Trap Will Feed	Approx. Shipping Weight
1	1"	44	2500	12500	4000	50	325 lbs.
2	1 1/4"	65	3750	20000	6500	75	375 lbs.
3	1 1/2"	86	5000	27500	9000	100	435 lbs.
4	2"	110	6500	35000	11500	125	500 lbs.
5	2 1/2"	175	10000	50000	16500	200	650 lbs.
6	3"	500	15000	70000	23000	250	1050 lbs.
7	3 1/2"	1000	30000	90000	30000	500	2000 lbs.
8	4"	2000	60000	120000	40000	1000	3000 lbs.

Capacities or Ratings of Traps Nos. 1 to 5 are based on one cycle of operation per minute: on Nos. 6 to 8, one operation every two minutes.

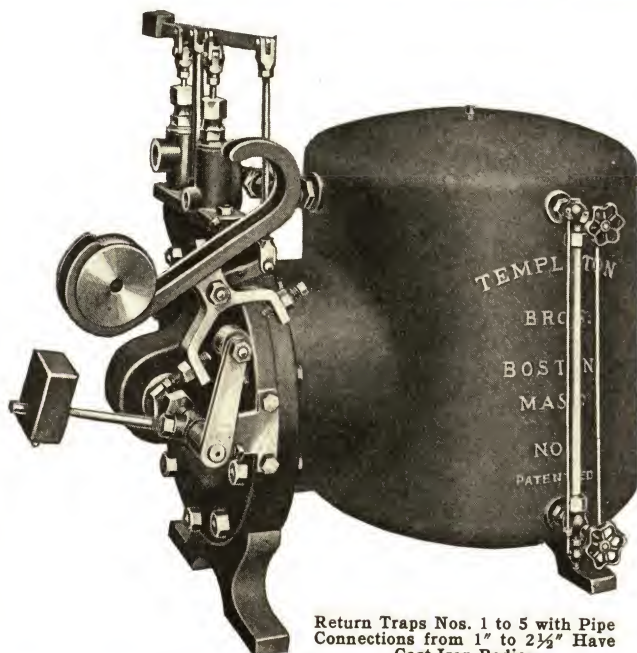
NOTE: These ratings are based on pumping conditions where the initial pressure is 25 pounds greater than the back pressure.

## THE TEMPLETON GUARANTEE:

Every Templeton Return Trap is guaranteed to be free from defective workmanship or material, to function perfectly and to fulfill all claims in every respect. Twenty-five years of steam trap manufacturing and engineering experience is back of the above guarantee.

## SERVICE:

Selection of a return trap is very important as details should be considered. Our engineers will be glad to co-operate with you and advise you on any kind of installation. If you have any special condition please write to us and your questions will receive our prompt attention.



Return Traps Nos. 1 to 5 with Pipe Connections from 1" to 2 1/2" Have Cast Iron Bodies



# THE TERRY STEAM TURBINE CO.

TERRY SQUARE, HARTFORD, CONN.

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 HOUSTON, TEXAS . . . . . A. M. Lockett & Co., Ltd., 1014 Electric Bldg.  
 INDIANAPOLIS, IND. . . . . Mr. E. A. Grimmer, 5271 Carrollton Ave. (For mail:  
 Box No. 24, 42nd St. Station)  
 LOS ANGELES, CAL. . . . . The T. S. T. Co., 912 East Third St.  
 MARINE DEPT. . . . . The T. S. T. Co., 117 Liberty St., N. Y. C.  
 MEMPHIS . . . . . The T. S. T. Co., 2905 Sterick Bldg.

MILWAUKEE, WIS., The T. S. T. Co., Room 502, Guaranty Bldg., 312 E. Wisconsin Ave.  
 MONTREAL, QUEBEC, Fraser & Chalmers of Canada, Ltd., Crescent Bldg., 1411 Crescent St.  
 NEW HAVEN, CONN. . . . . The T. S. T. Co., 22 Fountain St.  
 NEW ORLEANS, LA., A. M. Lockett & Co., Ltd., 505 Queen and Crescent Bldg., 344 Camp St.  
 NEW YORK CITY . . . . . The T. S. T. Co., 90 West St.  
 PHILADELPHIA, PA., The T. S. T. Co., 1109 Otis Bldg., 16th and Sansom Sts.  
 PITTSBURGH, PA. . . . . The T. S. T. Co., 311 Ross St.  
 PORTLAND, OREGON . . . . . The T. S. T. Co., 112 S. W. Pine St.  
 RICHMOND, VA. . . . . The T. S. T. Co., 301 American National Bank Bldg.  
 ST. LOUIS, MO. . . . . The T. S. T. Co., 5473 Delmar Blvd.  
 SAN FRANCISCO, CAL. . . . . The T. S. T. Co., 420 Market St.  
 SYRACUSE, N. Y. . . . . The T. S. T. Co., 200 Herald Bldg.  
 TORONTO, ONTARIO, Storey Pump & Equipment Co., 607 Harbour Commission Bldg., Foot of Bay St.  
 TULSA, OKLA., Worthington Machinery Corp. of Okla., 424 No. Boulder Ave.  
 WILKES-BARRE, PA. . . . . The T. S. T. Co., 314 Coal Exchange Bldg.

## PRODUCTS:

Steam Turbines; Gears; Flexible Shaft Couplings; Turbo-Generator Units; Etc.

## TERRY STEAM TURBINES:

Each Terry Turbine is specially designed for the conditions under which it will operate. Therefore, in writing for information, the following data should be included so that we can offer the turbine best suited to your conditions: (1) Steam pressure available at the turbine inlet. (2) Temperature of steam. (3) Exhaust steam pressure. (4) Horsepower required. (5) Revolutions per minute at which driven machine will operate. (6) Make, size and type of machine which turbine will drive and any special details or requirements.

**Applications:** Terry Turbines are used to drive centrifugal pumps, blowers, fans, generators, exciters, coal pulverizers, paper machines, line shafting and many other types of apparatus. Vertical turbines are used to drive deep well pumps, blowers, etc.

**Sizes and Types:** All sizes up to 2000 H.P. and for all steam pressures and exhaust pressures. Built for condensing, non-condensing, low pressure, mixed pressure and bleeder operation. Turbine may be either direct connected to driven machine or through Terry herringbone gears. Vertical turbines in capacities up to 600 H.P. are also available.

**Terry Multi-Velocity Stage Turbines:** Durable and trouble proof. Employ an indestructible one-piece wheel made from a steel forging. The buckets are milled from the solid metal. The power producing action of the steam in the wheel takes place entirely on the curved surfaces at the back of the buckets. Wear at this point does not affect the angle at which the steam enters or leaves the wheel.

Therefore, these turbines will maintain their original capacity for years. Blades have large clearances and are further protected by projecting rims at the sides of the wheel. It is impossible for the blades to foul. High efficiencies are obtained even at low speeds. *Bulletin S-84.*

**Terry Multi-Pressure Stage Turbines:** Employ a high pressure and low pressure element. High pressure element consists of a two or three-row velocity wheel; low pressure element consists of several stages of the Rateau type. Machines are so designed that the correct number of stages can be used to fit exactly the conditions under which turbine will operate. *Bulletin S-80.*

**Governors and Control Mechanisms:** Turbines may be equipped with various types of governors: (A) Constant speed, either direct acting or oil relay type. (B) Variable speed hydraulic fluid. (C) Overspeed trip. All Terry overspeed governors include entirely separate tripping mechanism and separate overspeed valve. They are in no way connected with

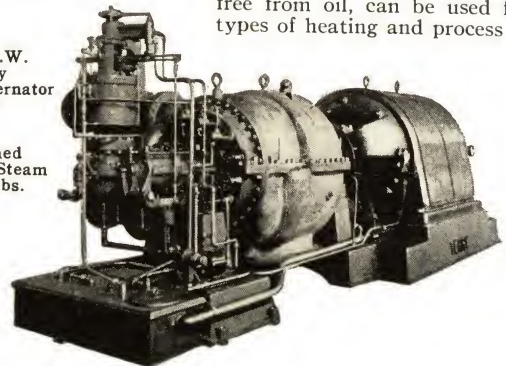
main governor valve. (D) Pump governors constant or excess pressure type. (E) Remote speed control mechanisms can be supplied so that turbine speed can be controlled from some distant point. (F) Governors to meet special requirements can also be designed. Tell us your problems and we will assist in their solution.

## TERRY TURBO-GENERATOR UNITS:

Made in all sizes from 5 to 1000 K.W. d.c. or a.c. Geared or direct connected. Units may be designed for bleeder pressures or back pressures of 100 lbs. or over. The exhaust steam, clean and free from oil, can be used for all types of heating and process work.

1000 K.W.  
Terry  
Turbo-Alternator  
Unit

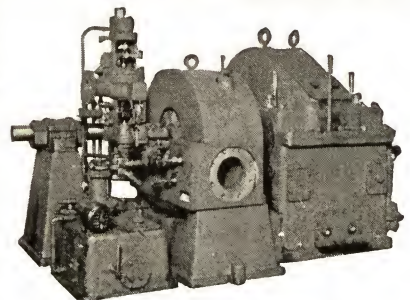
Designed  
to Bleed Steam  
at 50 Lbs.



## VARIABLE SPEED TURBINES:

Are the result of many years of experience in supplying variable speed drives for paper machines—a service that is extremely exacting due to the accurate governing that is required at all speeds.

Units are equipped with the Terry Hydraulic Fluid Type Governor. This mechanism permits the turbine speed to be varied throughout a wide range while the unit is in operation. Accurate governing is obtained at all speeds.



600 H.P. Terry Turbine Gear Unit.  
Equipped with Variable Speed Governor  
and Remote Speed Control

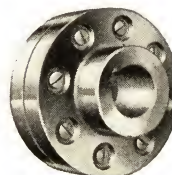
## TERRY HERRINGBONE GEARS:

Used for speed increasing or reducing.

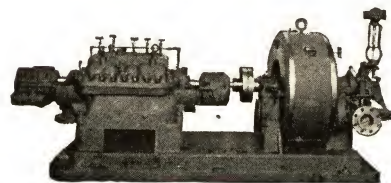
Gears and pinions are double helical type. No end thrust. Forced feed lubrication throughout. Oil pump below normal oil level insuring copious lubrication when starting. Bearings and gear housing are of extremely rugged construction. Cool, quiet, efficient. Specially designed for high speed service. Conservative rated. *Bulletin S-17.*

## TERRY FLEXIBLE COUPLING:

High grade, accurately constructed coupling of pin and bushing type. Faces and peripheries of coupling flanges are accurately ground to facilitate checking alignment. Flanges are made from steel forgings. Sizes from 1 to 12 in. maximum shaft bore. When making inquiries, state diameter of shaft, revolutions per minute, horsepower transmitted and type of machines to be connected. *Bulletin S-66.*



Forged Steel  
Shaft Coupling



Boiler Feed Pump with Terry Turbine  
Drive, Equipped with Excess Pressure  
Pump Governor



# THE TIMKEN ROLLER BEARING CO.

GENERAL OFFICES, BEARING PLANT, STEEL, ROLLING AND TUBE MILLS  
CANTON, OHIO

*Manufacturers of Tapered Roller Bearings*

Branch Engineering and Sales Offices in All Principal Cities

## THE TIMKEN TAPERED ROLLER BEARING:

**Design:** The Timken Tapered Roller Bearing consists of three load-carrying elements: (1) a set of tapered (or conical) rollers operating between (2) an inner tapered race, or cone and (3) an outer tapered race or cup. True rolling motion is assured by making the apexes of the conical surfaces of the cone, cup and roller coincide on the axis of the bearing.

An important feature of the Timken Bearing is *positive roll alignment*. To secure it, the large end of each roller is made to square exactly with the center line of the roll, so that contact of the roll end with the cone rib is made in two widely separated areas. This assures positive alignment of the rolls at all times. The cage does nothing more than properly space and retain the rolls about the cone or inner race.

The fundamental principle of Timken tapered construction combined with Timken positive roll alignment, Timken precision construction and Timken-made alloy steel makes Timken the all-load, all purpose, enduring anti-friction bearing.

**Specific Advantages of the Timken Bearing:** **POWER SAVING:** On account of the true rolling motion of the Timken Bearing, friction, whether resulting from radial or thrust load, is eliminated. Actual everyday service in all types of machinery shows substantial power savings resulting directly from Timken Bearing applications.

**LOAD CAPACITY:** The greater load area of *line contact* plus tapered construction, assures *continuous* full capacity of the Timken Bearing for *radial* loads, *thrust* loads or both in any combination.

**LUBRICANT ECONOMY:** Timken Bearing applications may be designed in such a way that there is ample

space in the housing for a liberal supply of lubricant. Tight closures prevent the escape of lubricant and the ingress of dirt. Usually it is only necessary to renew the lubricant at very infrequent intervals. This saves both lubricant and time. Prevention of oil leakage is particularly important in manufacturing plants where damage to the product might result from it.

**NO SHAFT WEAR:** All moving contact in Timken Bearings is between the hardened and ground surfaces of the bearings themselves. Thus there can be no wear on shafts or in wheel hubs, and initial precision is retained indefinitely.

## ENGINEERING POLICY:

It has been the policy of The Timken Roller Bearing Company for many years to extend the facilities and successful experience of its engineering department to those who are considering the applications of Timken Bearings to their own product. Timken Bearings have always been sold and guaranteed not just to carry a given load at so many r.p.m. but to perform successfully in positions where the size of the bearing and the manner of application have been approved by Timken engineers.

This service is rendered confidentially, without charge or obligation, and is used constantly by leading manufacturers. Timken Bearing applications should be approved by the Timken Engineering Department, as the Company cannot be responsible for bearings used on mountings not approved, and the guarantee is dependent on this approval.

Engineers will find the *Timken Engineering Journal* unusually helpful since it contains dimensions sheets, load rating and capacity tables, speed capacity curves, simplified methods of calculating bearing loads, information on fitting practices, assembly and lubrication. In addition to the general data supplementary sections relating specifically to the use of Timken Bearings in conveyors, shop trucks, mine cars, oil field equipment, farm machinery, machine tools, aircraft and cranes are available and will be sent on request.

## THE STANDARD TIMKEN BEARING:

The tapered construction of the Timken Bearing makes it necessary to design equipment so that the bearings may be mounted in pairs. This follows because a heavy radial load on one bearing sets up a small thrust load on the other. The mounting, therefore,

must be made in such a way that the load reactions in the bearings will be opposed.

Although by far the great majority of applications lend themselves especially well to the installation of standard Timken Bearings, yet in certain fields it has been found desirable to develop special types to meet specific loads or service conditions.

## TIMKEN MILL TYPE BEARINGS:

In the past few years marked progress has been made in the development and application of Timken Bearings to roll necks in steel mills and other similar applications. Experience has proved that through the application of Timken Bearings

to a steel mill and auxiliary units, such as gear drives and pinion stands, savings in power as high as fifty per cent are made.

Installations have been made in numerous types of mills, and Timken Bearings with radial capacities of millions of pounds are in successful operation. Usually, applications of this nature require special studies and The

Timken Roller Bearing Company has acquired a fund of useful knowledge and experience in determining roll pressures and the most satisfactory Timken Bearing application for mill service.

## TIMKEN ADJUSTABLE NON-ADJUSTABLE BEARING:

This bearing is designed for use in positions where the use of two rows of rolls is desirable, and where, hitherto it was necessary to use two separate single row bearings. It is also intended to take care of float, and to replace double row bearings of other types, giving additional load capacity without increasing the O.D. While primarily a non-adjustable bearing, it is possible to take it up to compensate for wear under certain conditions.

This bearing is manufactured in standard and steep-angle designs, the latter being recommended for positions where the thrust load requirements are unusually severe.

## THRUST TYPE BEARING:

Manufacturers of oil well swivels, clayworking machines and other equipment where the loads are essentially thrust have found this type of Timken Bearing admirably suited to their needs. The design does not permit carrying radial loads and where these are present it is necessary to provide other means to carry these loads.

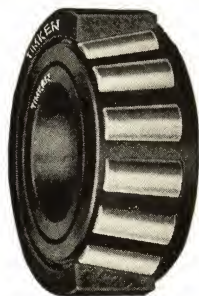


Fig. 1. Standard Timken Bearing

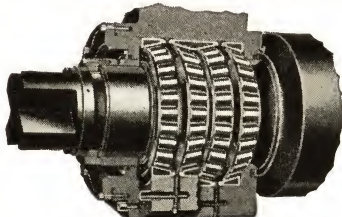


Fig. 3. Timken Heavy Duty Roll Neck Bearing

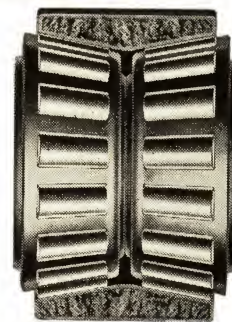


Fig. 2. Timken Adjustable Non-Adjustable Bearing



Fig. 4. Timken Thrust Bearing



# TITEFLEX METAL HOSE CO.

499 FRELINGHUYSEN AVE., NEWARK, N. J.

## SALES OFFICES

CHICAGO, ILL. . . . . Merchandise Mart, Room 1112  
DETROIT, MICH. . . . . 2-252 General Motors Bldg.  
CLEVELAND, OHIO . . . . . 1101 Hippodrome Bldg.  
ATLANTA, GA. . . . . 787 Penn Ave., N. E.  
BOSTON, MASS. . . . . 49 Federal St.

PHILADELPHIA, PA. . . . . Bourse Bldg.  
SAN FRANCISCO, CAL. . . . . 950 Van Ness Ave.  
DENVER, COLO. . . . . 165 Downing St.  
DALLAS, TEX. . . . . P. O. Box 2064  
MINNEAPOLIS, MINN. . . . . 1710 N. 19th St.

## REPRESENTATIVES

ST. LOUIS, MO. . . . . 4549 Olive St.  
SAN FRANCISCO, CAL. . . . . 950 Van Ness Ave.  
KANSAS CITY, MO. . . . . 208 East 16th St.

LOS ANGELES, CAL. . . . . 1835 So. Hope St.  
SEATTLE, WASH. . . . . 1530 11th Ave.  
PORTLAND, ORE. . . . . 9th and Glisan Sts.

## TITEFLEX ALL-METAL FLEXIBLE HOSE

For more than fifteen years Titeflex All-Metal Tubing has been successfully used to solve the problem of a flexible metal connection in the commercial and industrial fields where it has proven its efficiency and dependability under severe service conditions. It is used as plant equipment by manufacturers in varied lines because of its adaptability and wide range of applications in industry. Titeflex is furnished as standard or original equipment by organizations manufacturing and marketing machines or devices requiring a flexible metallic connection of quality.

Titeflex All-Metal Tubing differs in construction from all other types of flexible metal hose and tubing. It is fabricated under a patented process and because of its distinctive features it exhibits marked characteristics most desirable in a flexible connection. Titeflex is the only pressure tight flexible tube made of metal strip that does not rely on an interlocked *sliding* joint to produce flexibility. Titeflex is all-metal. Because of this all-metal construction the tube is inherently tight for the carrying of liquids and gases.

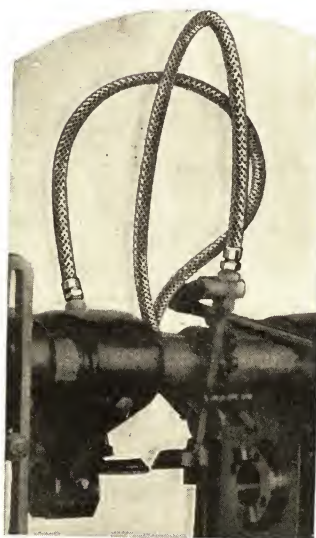
**Special Features:** The product of the TITEFLEX METAL HOSE CO. is made of a profile strip spirally wound into a convoluted tube having a double locked fixed seam on top of each convolution. Through the convolution and diaphragm construction, this tubing attains a high degree of flexibility, while its strength and tightness is assured by the pressure tight double locked fixed seam on top of the diaphragm section. This seam is rolled under heavy pressures, making a homogeneous mass of metal. Titeflex is inherently tight due to this unique construction.

Where great flexibility is desired, single fine wire braid is supplied on Titeflex, and a double braid where the conditions are more severe, particularly where high internal pressure is encountered. The flat ribbon braid is used when flexibility is not the essential quality but the absorption of vibration is desired and mechanical support to the tubing is sought. An interlocked armor may be used over the braided Titeflex tube to give added protection and reinforcement against handling, or when forced bends are liable to occur.



## FLEXIBLE ALL-METAL

STEEL TUBING      BRASS TUBING  
BRONZE TUBING      EXHAUST TUBING



## SIZES AND SPECIFICATIONS OF STANDARD TITEFLEX TUBING

Approx. Inside Dia., In.	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	3
Approx. O. D. In., Single Braid	.33	.42	.50	.58	.78	1.06	1.38	1.64	1.98	2.51	3.25	..
Approx. O. D. In., Double Braid	.39	.48	.56	.64	.84	1.12	1.44	1.70	2.04	2.58	3.35	3.85

## CATALOG

Descriptive Catalog No. 109 sent on request.



Titeflex Line Showing Double Braid, Inner Tube and Pipe Union for High Pressure Industrial Service



Titeflex Gas or Oil Line, Showing Single Braid, Inner Tube and S.A.E. Union Coupling

The seam in Titeflex being permanently fixed and free from any internal rubbing action will show no appreciable deterioration after long periods of use. The absence of organic material that can be detached or dissolved insures the purity of the liquid conveyed, and the original capacity and reliability are maintained in all Titeflex assemblies.

## Approvals and Listings:

Bureau of Steam Engineering for U. S. Navy.

United States Shipping Board for oil burners.

Bureau of Construction and Repair for U. S. Navy.

Underwriters' Laboratories, O. B. Line Oil burners.

Department of Commerce, fuel lines, licensed aircraft.

Underwriters' Laboratories, carrying flammable liquids.

U. S. Bureau of Standards—100 per cent efficient for gas.

American Gas Association Testing Laboratory.

**Inspection:** Every piece of Titeflex is carefully inspected throughout the process of manufacture and is finally subjected to pressure tests materially higher than that of service.

**Couplings:** We supply all pipe threaded and S. A. E. fittings for the corresponding sized tubings. This includes the male, female and union connections for both classifications of couplings. More detailed information on request.

**Applications:** Flexible connections to carry the following:

Gas	Starch	Varnish	Gasoline
Oil	Oxygen	Hot air	Acetylene
Air	Tallow	Alcohol	Asphaltum
Water	Grease	Cutting	Lubricants
Steam	Exhaust	Compounds	Tooth paste
Paint			Tar products

## Instructions for Ordering Titeflex:

(1) Material to be conveyed. (2) Maximum pressure to be carried. (3) Nature of service to be performed. (4) Inside diameter of the tubing wanted. (5) Kind, size and thread of couplings required. (6) If there is a temperature element, advise degree of heat encountered. (7) The exact length of each piece between faces of parts to be connected.



# TROY ENGINE & MACHINE COMPANY

Established 1870

TROY, PA.

*Manufacturers of Vertical and Horizontal Flat and Piston Valve Steam Engines, Generating Sets, Generators, Switchboards*

Sales Representatives in Fifty Principal Cities

## STEAM ENGINES, GENERATING SETS, AND BY-PRODUCT POWER:

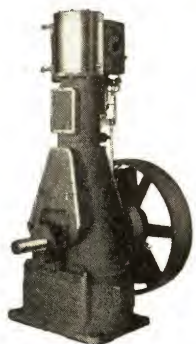
Certain operating characteristics of the modern steam engine or engine-generating set make it ideal for generating By-Product Power. This, as is well known to engineers, involves making double use of steam: mainly for processing or heating purposes but *first* as a source of mechanical or electrical power. Every plant that has use for both steam and power has somewhere a heat-balance which if mechanized with the proper equipment means that the steam for heating or processing will cost no more than if live steam is used and the power generated as a "by-product" costs considerably less than if purchased or generated as a primary product.

Under many conditions, the modern steam engine or engine-generating set will produce this "By-Product Power" at a cost lower than can any other equipment.

## TROY-ENGBERG STEAM ENGINES AND GENERATING SETS:

These are modern in every respect and offer the following advantages: low steam consumption; original heat balance maintained for years; high starting torque; no long warming up period; wide speed range under close control; small loss of efficiency at reduced speeds; choice of flat or piston valves; no fire hazard; accessibility; simple adjustments which, once made, hold; no "shopping" required to make replacements; long and satisfactory service.

Troy-Engberg Steam Engines are the result of more than forty years' specialization in the manufacture of steam engines. The Generating Sets have been on the market for more than thirty-five years. Every effort has been made



Standard Duty Vertical Steam Engine

Troy-Engberg Generating Sets are equipped on the power end with the Troy-Engberg Steam Engines just described. On the electrical end they conform to the highest standards and to the latest practice as to windings, insulation, temperature rating, etc.

The D. C. units range from 4 to 150 K. W.

It can do this because it most nearly balances the heat units needed for processing or heating and the power required in the plant.

One of the more common methods of taking advantage of By-Product Power is to connect the Steam Engine to a stoker, pump, fan, blower, mixer, line-shaft, generator, etc., and pass the exhaust into the heating or processing system. The Engine-Generating Set functions in a similar manner except the engine is driving the generator in a self-contained unit.

## ENGINEERING SERVICE:

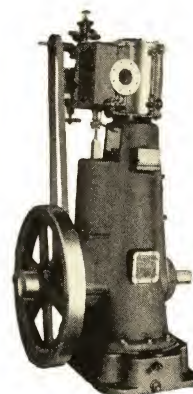
Send in the details of your steam requirements for heating or processing and where and how you use power (mechanical or electrical) in your plant. Our engineers will be glad to send you an estimate of what By-Product Power can do in the way of lowering costs.

and is being made to improve the designs so as to add still further to their inherent usefulness and efficiency. Some of the recent improvements in the Steam Engines are: watershed for the vertical engines that prevents condensate from getting into the bearing oil; choice of flat or piston valve for all types and sizes of Troy-Engberg Engines; choice of throttling or automatic governor; hand adjustable or variable eccentric; fully enclosed; self-oiling and completely leak-proof; improved oil reservoir with water separator.

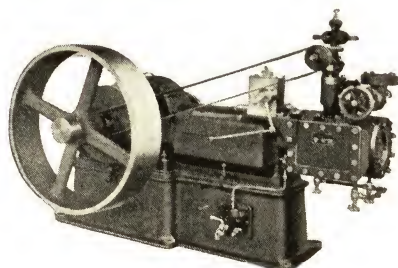
Both horizontal and vertical type engines are made. Sizes range up to 225 H. P. Single Cylinder and up to 450 H. P. Duplex units. Suitable for all conditions of pressure, superheat and back pressure.

two or three wire. The A. C. Sets range from 6.3 to 187 K.V.A. with direct connected or belted type exciter.

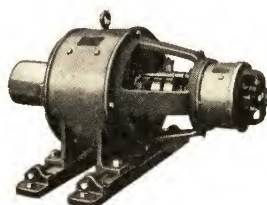
Troy-Engberg Generators are built in ball bearing bracket type for D. C. ranging from  $\frac{1}{3}$  to 60 K. W. and for A. C. from 1 to 63 K.V.A. They are arranged for direct connection or belting to engines or motors.



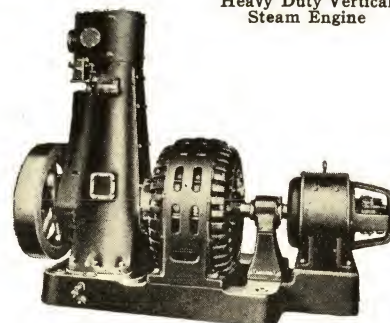
Heavy Duty Vertical Steam Engine



Horizontal Steam Engine



Bracket Type Generator



Generating Set



# TWIN DISC CLUTCH COMPANY

1322 RACINE ST., RACINE, WIS.

Parts Stations in 23 Principal Cities

*Clutches, Clutch Pulleys, Power Take-off Units, Clutch and Reduction Gear Units*

## TWIN DISC CLUTCHES:

**Heavy Duty Uses:** In sizes from 3" to 42" in diameter, are designed for all types of machinery used in road building, material handling, agriculture, oil field production, textile manufacture. . . where economy and efficiency demand greater starting torque than the prime mover can provide. Hubs are designed to take the full range of shaft size appropriate to the power and load limits of the clutches.

**Light Duty Uses:** Twin Disc Clutches for machine tools, textile machines and small motor drive can be furnished either to run dry or in oil—from 3" to 12" in diameter, with working torque from 0.3 to 112 hp. per 100 rpm.

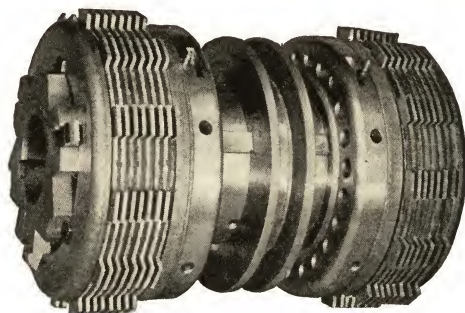
**Properties:** Twin Disc Clutches are designed to give dependable service at high or low speeds, under severe or exacting heavy duty conditions. All equipped with Twin Disc Patented Adjustment which provides for simultaneous take up on all levers without the use of tools.

Exceptionally large frictional areas are characteristic of all sizes and styles of Twin Disc Clutches. This feature, together with accurate machining to close tolerance limits and the use of the highest grade materials, insures longer life and a fine quality of smooth engagement and positive operation at all times.

**Inspection:** To insure a uniformly high standard of quality and trouble-free replacements, all parts of Twin Disc Clutches are carefully checked with micrometers and special gauges through every operation of manufacture and assembly.

**Engineering Data** concerning any clutch installation will be furnish upon request. The following will describe a few typical designs of Twin Disc Clutches.

## CLOSE COUPLED MULTIPLE DISC CLUTCHES:



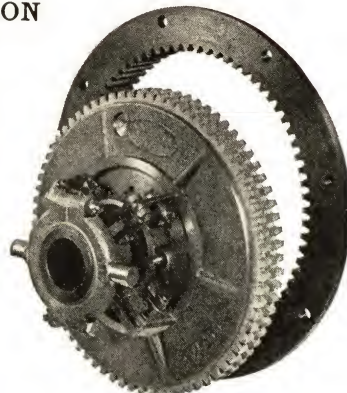
Close Coupled Duplex Clutch

Close Coupled Type Multiple Disc Clutches are particularly designed for compactness and are especially suited for use in machine tools and similar limited space installations. These clutches can be furnished to run dry or in a spray of oil and in either single or duplex construction. They are furnished in the following sizes: 2½", 3", 3½", 4", 4½", 5", 5½", 6", 7", 9", 10", and 12".

## INTERNAL COMBUSTION ENGINE CLUTCHES:

**Sizes:** Made in 10", 11½", 14", 16", 18" and 24" sizes. Single or Double Plate.

**Capacity:** The 11½" clutch illustrated is a typical design especially suited to applications with internal combustion engines. This is a very satisfactory clutch for installations where a trouble-free and high capacity clutch is required.



Internal Combustion Engine Clutch

## MODEL B.F.T. CLUTCHES:

Model B.F.T. clutches are suitable for power transmission installations of every description, such as couplings for line shafts, as drives for pulleys or for spiders carrying gears, sprockets or pulleys. They are suitable for speeds up to 1000 rpm. and are built for heavy duty service under severe conditions. They can be furnished with ball bearing or plain pulleys or with standard spiders having ball bearing, bronze bushed or plain hub as shown on the cut.



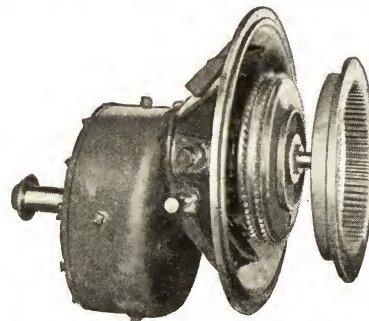
No. 8119-B.F.T.-2-8 Clutch

## MODEL G CLUTCHES:

Designed for use on fractiona! horsepower motors, power lawn mowers, washing machines, power sprayers, pumps, power planters and similar small industrial or agricultural, high speed installations requiring a compact unit whose operating mechanism is not affected by centrifugal force when disengaged. The component parts are of the simplest form, and are designed in such a manner that no cotter pins or similar fastenings are required. The levers, housed within the hub structure, are operated by a cone of internal form. The clutch is made in dry plate form, and also for use in oil spray.

## REDUCTION GEARS:

Reduction gears can be furnished with various reductions, either engine-wise or anti-engine-wise rotation, for almost any size of gasoline motor.



No. 7386 G.T. Gear Reduction Unit

Mechanical Catalog (1934-35)



# UNITED CONVEYOR CORPORATION

1295 OLD COLONY BUILDING, CHICAGO, ILL.

*Pneumatic, Steam Jet and Hydraulic Ash Conveying Systems*

Representatives in Principal Cities in the United States and Canada

Exclusive Owners of the Patents and Manufacturing Rights of All Ash Conveyor Equipment Formerly Sold by  
Conveyors Corporation of America      American Steam Conveyor Corporation      Green Engineering Company  
Griffin Engineering Company      Girtanner-Davies Company

## "UNITED" NUVEYOR HEAVY DUTY ASH AND SOOT CONVEYOR

**For Complete Cleanliness:** The NUVEYOR offers a heavy duty conveyor system in which ash and soot are conveyed from every point of accumulation to any point of disposal by air alone through an enclosed pipe system. The special design of this enclosed system gives thoroughly dustless operation. Its cleanliness is most noticeable in pulverized fuel plants where the NUVEYOR handles the dustiest kind of ash and fly ash—as well as clinkers. Its power, labor, and maintenance requirements meet the present-day need for lowest possible cost. It is controlled by push button switches from each feeding point. Clean conditions are given by "United" Dustless Unloading Equipment at the ash storage tank.

Capacities are 6 to 30 tons per hour, handling the finest dust to the heaviest sidewall clinkers through conveyor lines up to around 800 ft. long. Ash intakes with 24 x 24-in. grid hoppers are located *inside* of the ash pit or furnace. The NUVEYOR is operated by a motor driven mechanical Exhauster, or by a Venturi type of Multi-Steam Jet Exhauster. In the latter case, no steam whatsoever comes in any contact with the ash.

## "UNITED" STEAMATIC PNEUMATIC ASH CONVEYOR

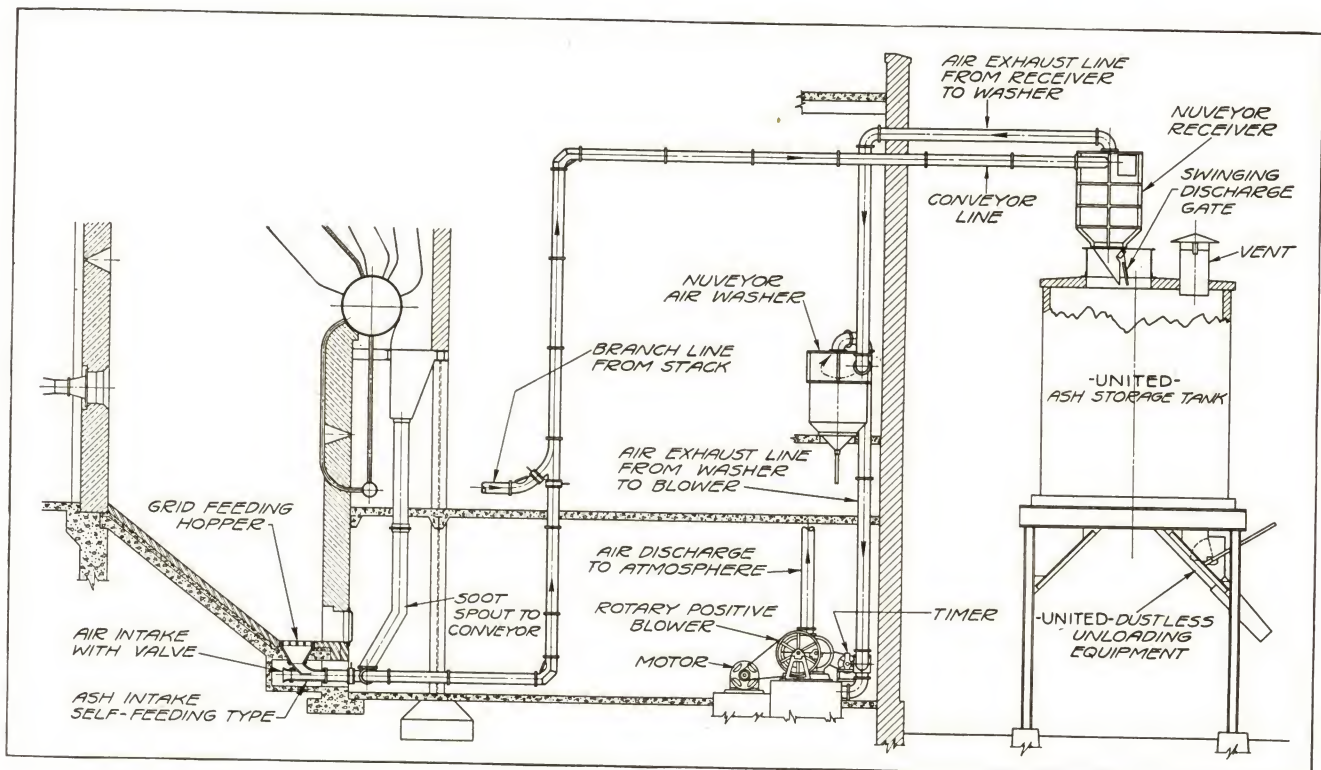
**For Moderate Duty:** The STEAMATIC Ash and Soot Conveyor employs basic features that are found in the NUVEYOR when operated by a steam Exhauster, but is designed for less severe requirements. Like the NUVEYOR, the STEAMATIC System conveys the ash from all points of accumulation to any point of discharge through a closed pipe system, assuring cleanliness from end to end.

## "UNITED" PNEUMATIC CONVEYORS

For light and heavy powders and granular materials in commercially dry condition, such as malt, grain, seeds, dusts, soda ash, lime, steel turnings, crushed ores, sugar, coal, coke, ashes, sand, etc. Dustless in operation with no loss of material. Capacities 2 to 100 tons per hour, over distances up to 2000 ft.

## OTHER UNITED PRODUCTS

"United" and "American" Steam Jet Ash Conveyors.  
Hydroveyor—Ash Sluicing Conveyor Systems.  
Cast Iron Ash Storage Tanks.  
Vitrified Glazed Tile Ash Storage Tanks.  
Air-tight Ash Pit Doors.  
Dustless Unloaders (for dry ash and dust).



NUVEYOR Ash and Soot Conveyor Operated by Motor Driven Mechanical Exhauster



# THE TORRINGTON COMPANY

Established 1866

TORRINGTON, CONN., U. S. A.

## TORRINGTON NEEDLE BUSHING

PATENT APPLIED FOR

Here is a bearing in which—in no more space than is required for a bronze or babbit bushing—is incorporated the principle of a roller bearing.



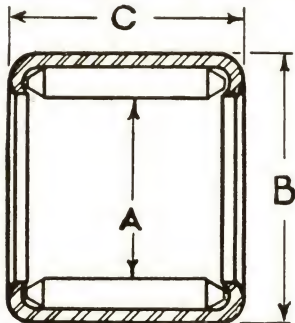
The principal advantages of Torrington Needle Bushings may be briefly summarized as follows:

### Small space required for installation

**Lubrication Advantages:** Due to the use of needle rollers, together with the turned in ends or lip construction of the shell, there is a large storage capacity for lubricant. The rollers are entirely covered with grease or oil so that the moving member actually revolves on a film of lubricant. The breakdown of this film can be only momentary as the rollers revolve and thus are continually bringing up a new lubricant covered surface.

**Load Carrying Capacity:** Torrington Needle Bushings, due to a full complement of rollers, and accurate construction, have a very great radial load carrying capacity.

**Ease of Assembly Due to Unit Construction:** The use of loose rollers around a shaft has been quite general but they are difficult to assemble. And when dis-assembling, the rolls are very apt to drop out and become lost. Torrington Needle Bushings are a complete unit, saving time in assembly and permitting easy dis-assembly.



The outside shell is made of drawing steel, cyanide hardened to give a smooth, long wearing bearing surface. The needle rollers are held in place by the unique construction of the shell, without the use of separate retaining rings or washers. The needle rollers are made from high carbon steel hardened throughout.

NEEDLE BUSHING DIMENSIONS

Catalog Number	"A" Nominal Shaft Diameter	"B" O.D.	"C" Length	Number of Rolls	Diameter of Rolls
B-88	1/2	1 1/8	1 1/2	29	.0606
B-812	1/2	1 1/8	1 1/2	29	.0606
B-912	3/4	1 3/4	1 3/4	32	.0611
B-108	3/4	1 3/4	1 3/4	36	.0596
B-1012	3/4	1 3/4	1 3/4	36	.0596
B-1212	3/4	1 3/4	1 3/4	31	.0844
B-148	7/8	1 1/2	1 1/2	36	.0835
B-1416	7/8	1 1/2	1 1/2	36	.0835
B-1616	1	1 1/2	1	41	.0829
B-1816	1 1/8	1 3/4	1	43	.0886
B-2016	1 1/4	1 3/4	1	47	.0894
B-2220	1 1/2	1 3/4	1 1/4	51	.0902
B-2420	1 3/4	1 3/4	1 1/4	37	.1390
B-2824	1 3/4	2 1/8	1 1/2	43	.1378

With sixty-eight years of experience in making needles, and with twenty-one years' experience in making precision ball bearings, the Torrington Company is very well qualified to design and manufacture an anti-friction unit requiring a knowledge of both products.

Our engineering department will gladly work with you in laying out Torrington Needle Bushing applications to your assembly.

# UNITED STATES HOFFMAN MACHINERY CORPORATION

AIRAPPLIANCE DIVISION

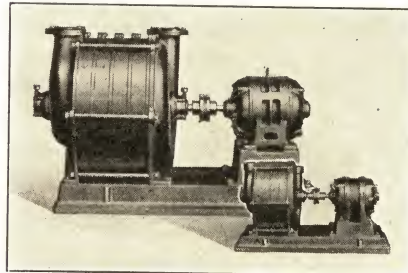
103 FOURTH AVENUE, NEW YORK, N. Y.

*Designers and Manufacturers of Multistage Centrifugal Blowers, Compressors, Exhausters, Pneumatic Sweeping Systems*

## BLOWERS AND EXHAUSTERS:

**Performance Characteristics:** Hoffman Blowers deliver clean, dry air without pulsation and at uniform pressures regardless of variations in volume. Give uninterrupted air delivery 24 hours a day where continuous duty is required—operate dependably for years without adjustment or replacement of parts. Centrifugal type—simple construction—no gears, valves or similar parts—

operate without mechanical noise, entirely free from vibration. Low power consumption—power input varies with load—current consumed only in proportion to air actually delivered.



Smallest Hoffman Blower Unit and One of the Larger Sizes

No loss in efficiency—no wearing parts inside the housing—Hoffman Blowers require no adjustment—deliver full rated capacities indefinitely. Simplest and most dependable type of blower.

**Applications:** Especially recommended for sewage disposal, pneumatic tube systems, heat treating furnaces, gas pressure boosting, agitation of liquids, ore flotation, folding and printing machines, wax spraying, pneumatic conveying and other applications for handling air or gas under pressure. Provide maximum dependability and economy under severest conditions of continuous duty operation.

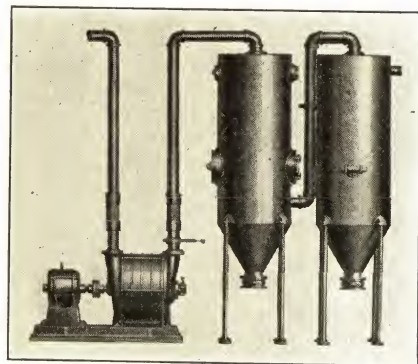
**Standard Sizes:** Available in sizes to fit a wide range of pressures and capacities for handling air or gas—any specified pressure from 8 oz. to 8 lbs. per square inch and vacuum from 1 in. to 12 in. of mercury; volumes from 30 C.F.M. to 14,000 C.F.M. Can be furnished for direct connected motor, steam turbine, belt or gas engine drive. Special sizes available upon request.

## PNEUMATIC SWEEPING SYSTEMS:

Hoffman engineers who design and build Hoffman Heavy Duty Vacuum Sweeping Systems have had many years of experience in the development and manufacture of dust handling equipment. Their record is backed by hundreds of successful installations in all types of industrial plants, power plants, etc. Hoffman Pneumatic Sweeping improves working conditions—eliminates dust and explosion hazards—prolongs life of machinery—postpones repainting. Factories are kept clean at lower cost than by old-fashioned methods—no periodic shut-downs for cleaning.

All dust enters nozzles and is deposited in collectors—rapid, safe, sanitary. Exhauster used in Hoffman systems maintains constant degree of vacuum regardless of number of hose lines in use. Special dust filters trap 98% of dust. Cleaning nozzles to fit all conditions—piping layouts furnished.

*Descriptive literature will be sent upon request. Thoroughly experienced engineers will offer recommendations in connection with all air handling problems. Representatives in all principal cities.*



Typical Assembly of Apparatus for Heavy Duty Industrial Pneumatic Sweeping Service



# UNIVERSAL GEAR CORPORATION

19TH & MARTINDALE AVENUE, INDIANAPOLIS, INDIANA

Sales Offices and Representatives in Principal Cities

*Manufacturers of Gear and Helicentric Speed Reducers with or without Built-in Motors*

## PRODUCTS

Universal Speed Reducers and Universal Moto-Gear Drives, incorporating the unique Heliocentric Reduction Principle. Also, Planetary, Helical, Bevel Gear, and Compound Reductions of several types.

Horizontal and Vertical mountings; Concentric, Offset, and Right-angle drives;  $\frac{1}{8}$  to 100 H.P. capacities; and Ratios from 2 to 1 to millions to 1.



TRADE-MARK

## LITERATURE

Catalog No. 400, an 84 page book carries comprehensive Engineering Data for the Universal line of Speed Reducers and Moto-Gear Drives—ratio and rating tables, selection instructions, constructional design, representative applications and installations.

Price quotations in Supplements 400-A, 400-B, 400-C, and 400-D.

## UNIVERSAL SPEED REDUCERS

The diversity of the Universal line is graphically indicated at the left. The larger unit has a 600 to 1 reduction with a rated capacity of 120,000 inch-pounds. The case is about 21 inches in diameter. The small unit, approximately 4" x 4" in size, is a 27,000 to 1 reduction, three stage Heliocentric, with a torque capacity of 8000 inch-pounds. This unusual little unit is used on both government and commercial airplanes for changing the pitch of the propeller blades while plane is in flight.

The Heliocentric Principle is the only radical development in speed reduction mechanism in the last quarter century.

Actuated by eccentrics on the input shaft, two batteries of radial plungers operate reciprocally into and out of stationary racks causing movement of the plunger holder, and with it, the output shaft. That, briefly, is the action.

Unusually compact and of high efficiency, this unique reducer has played a vital part in bettering the operating characteristics and increasing the marketability of many machines.

**Type 10:** Concentric or straight-line drive horizontal reducers in ratios of 4 to 1 to 36 to 1 with planetary elements; and in ratios of 20 to 1 to 80 to 1 with Heliocentric elements. Wide range of capacities.

**Type 10V:** Same as type 10 except with flange mounting for side-wall or for vertical placement.

**Type 10X:** Offset drive reducers, equipped with helical coupling gears working into either Planetary or Heliocentric elements, available in ratios from 6 to 1 to 376 to 1.

**Type 20:** Horizontal reduction units consisting of a Planetary or Heliocentric first stage (according to ratio required) working into a Heliocentric final stage. The drive is concentric. Standard ratios from 90 to 1 to 5760 to 1.

**Type R:** Right-angle drive reducers utilizing various combinations of Planetary, Heliocentric and Bevel gears. Output shafts may be horizontal or vertical as desired.

**Heliocentric Element without Case:** In addition to the many standard reduction units and Moto-Gear drives listed, the Heliocentric reduction assembly is available without case and is so used by many manufactures for standard installation in various types of motor driven apparatus and equipment.

Complete Moto-Gear drives are also furnished with special fittings and mountings designed to the manufacturer's order. The Universal Motorized Reducer, incorporated as standard design in a manufacturer's floor scrubber (photo at right), is a typical example.

Fractional H.P. Motorized Reducers are available in compact, integral units, in ratios from 2 to 1 to 376 to 1 (861 to 4.7 r.p.m. with 1800 r.p.m. motors);  $\frac{1}{8}$  H.P. to  $\frac{3}{4}$  H.P.; horizontal or vertical; concentric or offset drives.

Such units save space, look better, and operate more successfully under average conditions than motor and reducer installed separately.

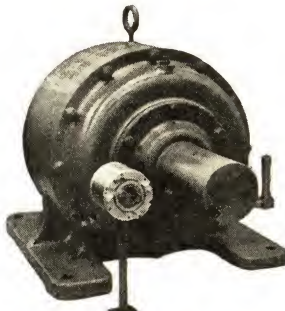
Integral H.P. Motorized Reducers are available in ratios from 2 to 1 to 376 to 1 in all standard sizes from  $\frac{3}{4}$  to 50 H.P.

The customer has a wide option in motor selection, and in addition, all special, as well as standard motors may be specified with the customary price differences that apply to the motor only.

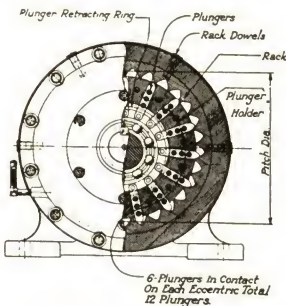
## VERTICAL MOTORIZED REDUCERS

We have been notably successful in this field because of the special adaptability of Universal reduction units to vertical installations with motors integral. No difficulties in providing lubrication or in keeping oil where it belongs are experienced in our design.

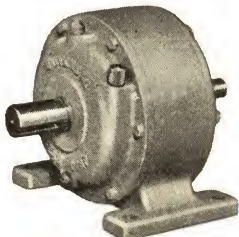
Ratios from 2 to 1 to 376 to 1 in Type 10 units. Ratios up to 5760 to 1 in Type 20 units. Output speeds of from 861 r.p.m. down to less than  $\frac{1}{10}$ th r.p.m. according to ratio and motor selected.



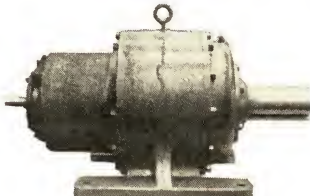
Illustrating Size Range



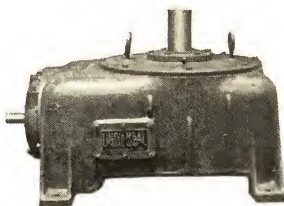
Heliocentric Principle



Type 10 Reducer



Type 20 Reducer



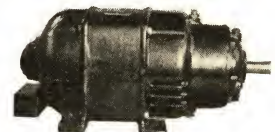
Type RV—Vertical Output



Heliocentric Assembly



Apparatus Installation



Type 10 ECM—Motorized Reducer



Type 10 XM—Motorized Reducer



Type 10 X Vertical—Motorized



Type 20 Vertical—Motorized



# HENRY VOGT MACHINE CO.

Incorporated

LOUISVILLE, KY.

NEW YORK

CINCINNATI

CHICAGO

PHILADELPHIA

CLEVELAND

KANSAS CITY

DALLAS

*Manufacturers of Drop Forged Steel Valves and Fittings, Water Tube Boilers, Oil Refinery Equipment, Ice and Refrigerating Machinery, Heat Exchangers*

## DROP FORGED STEEL VALVES AND FITTINGS:

Vogt Valves and Fittings are designed for high pressures and temperatures and forged from carbon or stainless steel which eliminates defects commonly found in other methods of

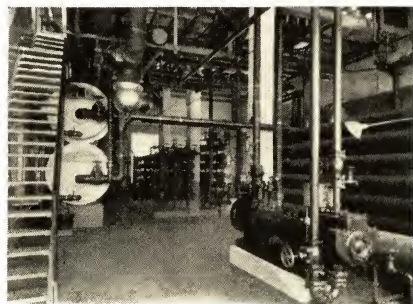


manufacture. If desired the parts of valves that come in contact with the corrosive agent may be forged of stainless steel and the other parts of carbon steel.

In this complete line will be found types especially suited for Power Plants, Chemical Plants, Refineries, and other industries where strength, durability, and resistance to corrosion and erosion are required.

## REFRIGERATING AND ICE MAKING SYSTEMS:

**Vogt Absorption System:** The Absorption System uses exhaust steam as a source of power; steam that is ordinarily wasted is thus utilized and the cost of operation reduced to a minimum. This machine is capable of producing very low temperatures.



Where conditions are suitable it can be combined with steam driven compressor units, making a very economical refrigerating installation.

Capacities range up to 250 tons refrigeration for single units.

**Vogt Compression System:** The Compression System may be steam, electric, or oil engine driven. Built in single or two stage compression for ice making and ordinary refrigerating temperatures. For minus 60 to minus 70 degrees F. compressors operating in three stages make a most satisfactory and efficient system.

Capacities range from 12 tons refrigeration to any required tonnage.

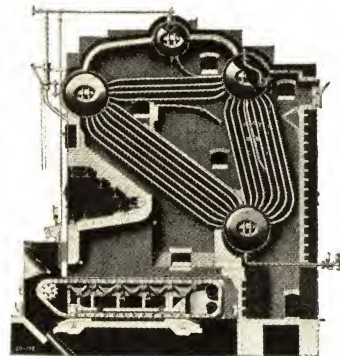
Condensers, rectifiers, exchangers, brine coolers, tanks, coils, etc., for either system are manufactured in the modern Vogt plant.

# Vogt

TRADE-MARK

## WATER TUBE BOILERS:

Vogt boilers are built in the three and four drum bent tube types and straight tube header types with cross or long drums. The three drum type is available in designs to fit any condition of restricted space for installation. All boiler construction conforms to the A.S.M.E. Codes for either riveted or fusion welded construction. Boilers are designed to assure high operating efficiencies and low maintenance costs using coal, oil, gas, or waste heat for fuel.

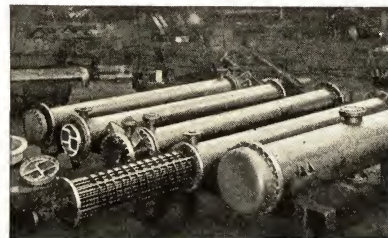


## HEAT EXCHANGERS:

Vogt heat transfer equipment represents the most advanced design and construction for efficiently conserving heat through exchange of temperature between ingoing and outgoing gases or liquids. They are available in many different types with fixed or removable tube bundles and baffle; as conditions may determine.

These exchangers are built for every temperature, pressure, or vacuum service of high tensile cast iron or all welded steel construction.

They serve most efficiently in such fields as Oil Refineries, Chemical Plants, Power Plants, Alcohol Plants, and Marine Service.



## OIL REFINERY EQUIPMENT (Homoweld or Riveted):

Still and Towers of every description for Refineries or Chemical Plants are built of either Homoweld or riveted construction strictly to the A.S.M.E. Code. Vogt shops are equipped to build vessels for every pressure and temperature in any size or shape within transportation limits.

Continuous Rotary Filters, Break Down Filter Presses, and Oil Chilling Machines are other Vogt products for the Refinery as well as special equipment which we build to order upon receipt of information.



## LITERATURE:

Bulletins and catalogs covering all Vogt products may be had upon request.



## VULCAN SOOT BLOWER CORP.

DU BOIS, PENNSYLVANIA

*Sole Manufacturers of Vulcan Soot Blowers*

Sales Representatives in All Principal Cities

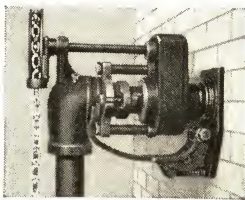
# VULCAN

SOOT BLOWERS for All Types of Boilers, Superheaters, Economizers, Air Heaters and Oil Stills.

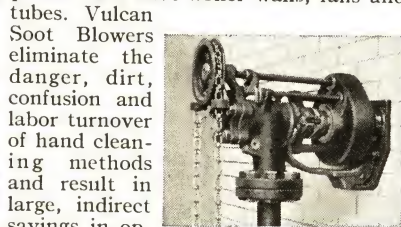
Vulcan Soot Blowers Effect Savings on Fuel and Operating Costs.

Vulcan Soot Blowers reduce the time required for cleaning by 90% over hand lance methods, resulting in reduced labor and steam expense and the further losses due to disruption of the normal operation of the boiler. Direct fuel savings of 4% to 8% also result due to the clean heating surfaces obtained by the use of Vulcan Soot Blowers.

Vulcan Soot Blowers increase the capacity of the boiler, decrease the draft loss and protect and save boiler walls, fans and tubes.



Vulcan Ratchet Head



Vulcan Valve-Operating Head

### A Type for Every Range and Design of Boiler

Vulcan Ratchet Head incorporates a step by step motion giving the effect of a stationary jet in a rotary element resulting in thorough cleaning with less use of steam and prevents careless operation whereby the element is revolved too fast for cleaning.

Vulcan Valve-Operating Head is a single unit embodying the valve and rotating device which are synchronized to function by operating one chain, thereby saving steam, labor, repairs, trouble and confusion over the independently operated type. May be had with the ratchet operation or gear drive.

### Distinctive and Vital Features

(1) Both types equipped with Flange or Union Outlet which decrease installation and maintenance costs. (2) Both types have adjustable Under Arm Support which carries the weight of the head and piping independent of the element, at the same time permitting movement of the head and element in all directions. Practically eliminates element warpage. (3) Extra long packing and accessibility for repacking. (4) Sweeps adjusted accurately at any time without dismantling the head. (5) Heads may be set in virtually any position instead of a few set positions. (6) Enclosed drive mechanism. (7) No Valve packing on Vulcan Valve-Operating Heads. (8) Single chain at front of head avoids confusion in operation. (9) Valve parts on Vulcan Valve-Operating Heads can be readily inspected or replaced without dismantling or removing heads. (10) Exceptionally low pressure drop through the heads. (11) On Vulcan Valve-Operating Heads the valve opens practically with the start of rotation of the element and closes instantly at the end of sweep.

### Improved Bearings

The Vulcan Soot Blower Corporation has developed an intimate contact bearing of new and scientific design made from a new heat resisting alloy called VULite, which has exceptionally long life and gives protection to the element, but at the same time provides economical first costs. The very satisfactory and reliable standard bearing and clamp have been improved.

### Superior Element for Each Location

VULcrom elements are fabricated from a thick wall seamless steel tube protected by a heavy integral deposit of pure chromium. Providing a high heat resisting element especially effective for all but the highest temperatures.

HyVULoy elements are used for the most severe locations. These elements are a thick wall seamless tube made from an alloy developed by the VULCAN SOOT BLOWER CORPORATION which gives the highest heat resistance for boiler service, consistent with high strength and freedom from brittleness and structural changes. Its heat resistance is further increased by a heavy integral deposit of pure chromium.

The nozzles for both types of elements are made from HyVULoy which are securely welded in place.

### Soot Blowers for Return Tubular Boilers

VULCAN SOOT BLOWER CORPORATION also manufactures a complete line of Soot Blowers for Return Tubular Boilers. Complete description and bulletins on request.

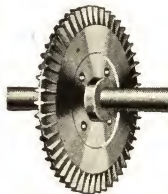
## WESTCO PUMP CORPORATION

GAINS & FRONT STS., DAVENPORT, IOWA

BRANCHES: NEW YORK, PHILA., CHICAGO, LOS ANGELES, SAN FRANCISCO  
Representatives in 50 Principal Cities

### LEADER IN SMALL PUMP FIELD

**Products:** Single-stage, double-suction STANDARD TURBINE PUMPS for low or high head duty. Sizes 5 to 400 g.p.m. against heads up to 1000 ft. CONDENSATION PUMPS AND RECEIVERS for layouts with 2000 to 50,000 sq. ft. radiation surface for operation against any desired head. SANITARY TURBINE PUMPS from 5 to 200 g.p.m. against heads up to 100 ft. AUTOMATIC WATER SYSTEMS from 250 to 3000 g.p.h. DEEP WELL TURBINE PUMPS from 20 to 200 g.p.m. against heads up to 500 ft. Underwriters' Laboratories approved TANK FILLING PUMPS for sprinkler, gravity and pressure tank supply. HOT OIL AND STABILIZER FEED PUMPS for Refineries and Natural Gasoline Plants.



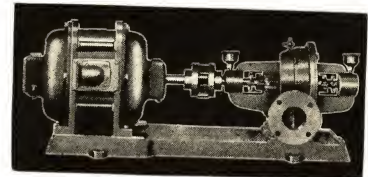
The Impeller—  
Westco's Only  
Moving Part

Liquid is pumped by the rotation of the one-piece Impeller which operates without metal-to-metal contact inside pump chamber. The liquid is energized many times by Westco's multi-vaned Impeller. This re-energizing characteristic gives much greater impetus to the liquid, thereby producing extremely high pressures in only single stage.

Westcos are unsurpassed for handling small capacities against high or low heads with remarkably high efficiency.

### DETAILED INFORMATION

Certified blue prints, architect's specifications, performance and selection tables gladly sent upon request. When requesting prices, please give: (1) kind of liquid, (2) gallons per minute, (3) head in ft. or pressure in lbs., (4) source of liquid supply, (5) power available, (6) temp. of liquid.



Standard Westco Turbine Pump,  
Direct Motor Driven. Also Equipped for  
Belt, Steam Turbine or Gas Engine Drive

**Features:** WIDE OPERATING RANGE—Adjusts itself to changes in the operating condition. Simply select pump and motor for maximum head you know will not be exceeded, and no matter how much less than this the head may actually be, the pump will deliver only a slightly increased capacity and the power required will decrease with the head, insuring against motor overload. SIMPLICITY—Only one moving part. ACCESSIBILITY—Westcos are easily disassembled without disturbing intake or discharge connections. QUIET OPERATION—No hum, no throb and no vibration. TROUBLE-FREE OPERATION—Will operate for months with one filling of grease cups and adjustment of packing glands. HIGH PRESSURES IN SINGLE STAGE—multi-stage performance in single-stage construction at moderate speed of 1750 r.p.m. DOUBLE SUCTION DESIGN—Creates a perfect hydraulic balance. PERFECT HYDRAULIC BALANCE—Eliminates all end thrust at bearings. Wear and consequent maintenance expense minimized. LOW POWER REQUIREMENTS—A remarkable fact in that Westco's efficiency is high. LOW COST—Westco offers all the advantages in design of a double-suction, horizontal split case pump plus improved efficiency, wider operating range and longer service life. Extreme simplicity permits economical construction from corrosion-resisting alloys. MINIMUM HEAD ROOM AND FLOOR SPACE REQUIRED—Westcos occupy only a fraction of space usually needed for pumps of comparable capacity. NO METAL-TO-METAL CONTACT—No internal metal-to-metal contact to require internal lubrication. Handles non-lubricating liquids without friction or wear. BALL BEARING CONSTRUCTION—Assures smooth, quiet operation and perfect alignment. REMOVABLE LINERS—which form the races or liquid channels are independent of pump housing. Each housing accommodates a number of different Liner combinations. Wide range of capacities or pressures produced by simply interchanging Liners and possibly Impeller. These parts are inexpensive and can be furnished in corrosion-resisting alloys. Life-time service assured for pump housing.

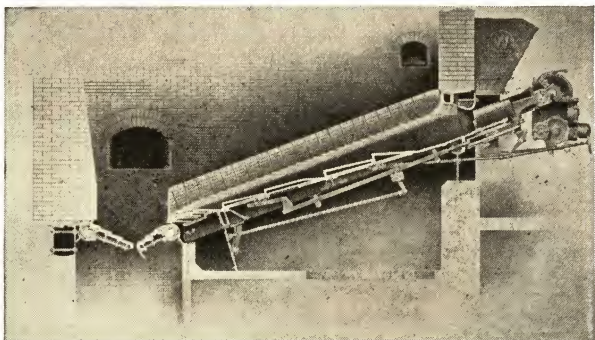


# WESTINGHOUSE ELECTRIC & MFG. CO.

EAST PITTSBURGH, PA.

## MECHANICAL STOKERS:

Large fuel savings are being effected by the application of present design Westinghouse stokers to boilers previously equipped with old designs of combustion apparatus. Over forty years' experience of Westinghouse in the design and manufacture of stoker apparatus assures a superior product.



Multiple Retort Underfeed Stoker with Dump Grate and Agitator

**Multiple Retort Underfeed Stokers:** For application to boilers approximately 400 horsepower and larger. The Unit Retort type of construction in various lengths, fitted with dump grates, link grates or clinker grinders, provides ample combination to facilitate the selection of a stoker best suited for the particular boiler used.

**Single Retort Underfeed Stokers:** For application to boilers approximately 400 horsepower or smaller. It is of the Center Retort type, with dump grates extending along the sidewalls of the boiler setting. This stoker is made in widths from 60 in. to 150 in., and in lengths from 6 feet to 9 feet.

## TURBINE-GENERATOR UNITS AND MECHANICAL DRIVE TURBINES:

Westinghouse builds a diversified line of turbines for both mechanical and electrical drive, ranging in capacity from  $\frac{1}{2}$  kw. up.

The mechanical drive units, adapted for both geared and direct-connected operation are used for driving fans, pumps and other rotary apparatus. They can be supplied in capacities from 5 hp. up. These turbines embody many exclusive features that are vital to reliable, efficient and satisfactory operation.

The generating units range in capacity from  $\frac{1}{2}$  upward. They are applicable for all general power and lighting purposes. In plants requiring process steam, the extraction or non-condensing units are especially suitable as clean exhaust steam is obtained.

## CONDENSERS:

All sizes and types of surface, jet and barometric condensers, vacuum apparatus, condensate and circulating pumps, exhaust connections, relief valves and expansion joints designed and built.

## HEAT EXCHANGERS:

Design and construction for specific conditions—reasonably low first cost—reasonable life during severe service—realization of the required temperatures.

True countercurrent flow of media for maximum mean temperature differences, and minimum terminal differences.

Adequate velocity within the tubes to assure turbulent flow yet not exceeding the pressure drops specified.

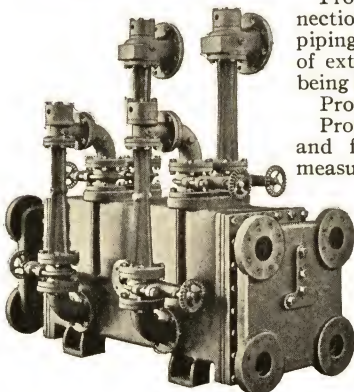
Turbulent flow across tube from side to side by suitable baffle. Accessibility for cleaning internal and external tube surfaces.

Proper arrangement of nozzle connections to simplify interconnecting piping and by-passing. Prevention of external or inter-leakage of fluids being handled.

Provision for expansion of parts. Provision for venting, draining, and for pressure and temperature measurements.

## STEAM JET AIR EJECTORS:

Steam Jet Air Ejectors are normally used for removing noncondensable gases from the condenser. Westinghouse Steam Air Ejectors are especially adaptable for use in vacuum process industries. The following types can be supplied: single-stage or



Two Air Ejectors Mounted on a Surface Type Inter and After Condenser

multi-stage non-condensing, or condensing type units with either jet or surface inter and after condensers.

## STEAM JET VACUUM COOLING UNIT:

Wherever there is a necessity for cooling, and steam is available, the possibilities of the application of a Westinghouse Steam Jet Vacuum Cooling Unit should be investigated. Such a high degree of efficiency is attained in these units that they are economical for a wide range of applications.

## MOTORS AND GENERATORS:

**Motors:** There are more than 22,000 different types and ratings of standard Westinghouse motors from which may be selected the most efficient motor for a particular drive.

Sealed Sleeve bearings are used on Westinghouse motors. They are dust tight and oil leakage proof resulting in marked economy of oil, much longer life and a very infrequent need for fresh oil.

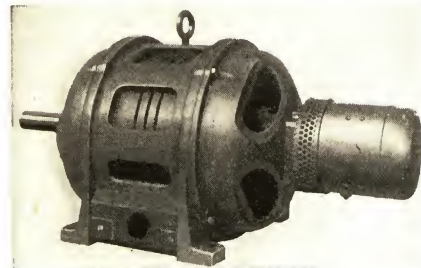
The windings are dual-protected against moisture, oil, dust and other agents that are the usual cause of insulation failure.

Frames of induction and high speed synchronous motors are of heavy cast iron with the feet an integral part of the frame. Frames of low speed synchronous and direct current motors are of structural steel fabricated by the electric arc.

Fractional horsepower motors, a-c. and d-c., are available for driving appliances and small machine tools. Type CS squirrel cage induction motors find wide use for driving all types of constant speed machinery. Types CW and CI wound rotor induction motors are applied generally where high starting torques with low starting currents are required.

Synchronous motors are finding a wide acceptance for constant speed, continuous duty applications where their high operating efficiency and ability to reduce power factor result in lower costs of operation. Direct Current Motors can be furnished in constant and adjustable speed types for many varieties of service in industrial plants where d-c. power is available. Heavy duty types for crane, hoist and mill service are also available.

**Generators:** Westinghouse a-c. and d-c. generators are built for direct and belted drive by motors, steam engines and diesel engines. The extensive use of structural steel fabricated by the electric arc results in generators that are strong and light. The extensive use of mica as an insulating material assures that the windings have unusually long life.



High Speed A-C Generator with Direct-Connected Exciter

## FLEXIBLE COUPLINGS:

Couplings which compensate for slight misalignment and absorb shocks and torsional vibrations are available in sizes and capacities for all classes of service.

## GEAR REDUCTION UNITS:

**Mill Units:** For heavy duty drives, such as main or auxiliary mill drives, hoists, crushers, pumps, fans, etc. Single Reduction, ranging up to 3000 hp. capacity and equipped with roller bearings and helical gears, or sleeve bearings and helical gears.

**Speed Reducers:** Single and double reduction units in capacities from 1 to more than 900 hp. with standard ratios from 2.82:1 to 70.5:1. Single helical gearing is used in these reducers, and roller bearings assure permanent alignment as well as minimum friction losses. Strength and rigidity have been obtained without sacrifice of compactness and simplicity.

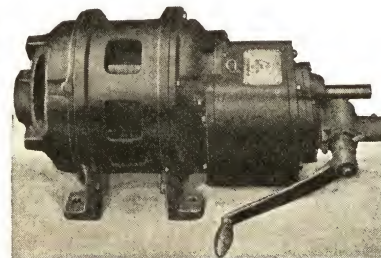
**Special Units:** To meet the special requirements of any type of service.

## GEARMOTORS:

Self-contained drive units that serve the double purpose of motor and speed reducer.

**Single Speed Units:** Have output speeds of 15 to 1550 rpm. and are made in capacities of  $\frac{1}{2}$  to 75 hp.

**Multi-Speed Units:** Have four instantly adjustable speed reductions and are made in capacities of  $\frac{1}{2}$  to 15 hp.



Multi-Speed Gearmotor

Mechanical Catalog (1934-35)



# WESTINGHOUSE TRACTION BRAKE COMPANY

GENERAL OFFICES AND WORKS: WILMERDING, PA.

PITTSBURGH	ATLANTA	CHICAGO	ST. LOUIS	LOS ANGELES	WASHINGTON	MEXICO CITY	HOUSTON	CLEVELAND
SAN FRANCISCO	ST. PAUL	SALT LAKE CITY	SEATTLE	BOSTON	DENVER	DALLAS	NEW YORK	TOPEKA

## WESTINGHOUSE AIR COMPRESSORS AND ACCESSORIES

Westinghouse Air Compressors are made in a great variety of types and sizes to supply air for every conceivable need. Simple, compact, reliable, efficient, durable, economical, Motor-, Belt-, or Steam-driven.

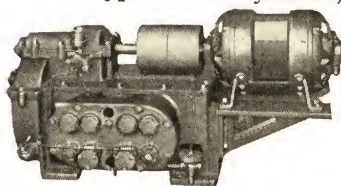
**Motor-Driven Air Compressors:** Compact, self-contained units that need no elaborate foundation nor heavy installation cost. Motors for any commercial circuit. Distinctive means for unloading during starting cycle. Start and stop method of control assures minimum operating cost. Flat washer type of inlet and discharge valves. Sizes 4 to 300 cu. ft. displacement, for pressures up to 200 lbs.

**"Y" Type:** Two cylinder, air-cooled, compound for continuous operation against pressures of 100 to 200 lbs., or single stage for pressures below 100 lbs. Controlled combined pressure and splash lubrication. Unloading feature interlocked with lubricating system to prevent delivery of air when oil supply is depleted. Very efficient, and delivers air at low power cost. Three general types: tank mounting with legs for fixed installation, or casters for portable use; bed-plate mounting for floor, or sill installation with separate tank; bare compressor with flywheel for line shaft, gas engine, or other power take-off. Sizes 4 to 31 cu. ft. *Catalogue T-2051.*



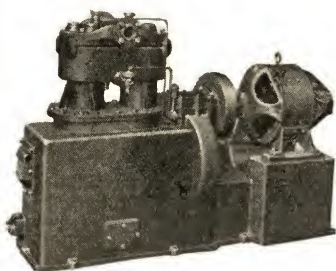
"Y" Compressor

**"N" Type:** Two cylinder, single stage, single acting, gear driven. Air-cooled for intermittent operation, "NB"; water-cooled cylinder heads for continuous operation, "NWB". Has positive and reliable unloader for A.C. motor drive. Sizes 12½ to 100 cu. ft. Pressures from 30 to 150 lbs. Complete portable outfits also. *Catalogue T-2048.*



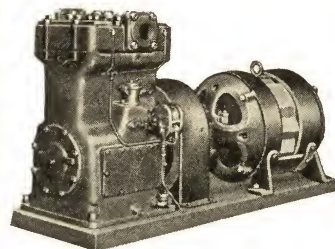
"NWB" Compressor

**"2V" Type:** Two cylinder, single acting, gear driven. Sizes 75 to 200 cu. ft. and three forms, viz., 2VSAW, single stage, air-cooled for intermittent operation against 40 lbs. (cooling effected by pressure air from the reservoir—first circulated through cylinder and head jackets and then discharged into line); 2VSW, single stage, water-cooled for continuous operation against 120 lbs. 2VCA, compound, for continuous operation, air-cooled, for pressures up to 135 lbs. Portable outfits also. *Catalogue T-2047.*



"2VSW" Compressor

der and head jackets and then discharged into line); 2VSW, single stage, water-cooled for continuous operation against 120 lbs. 2VCA, compound, for continuous operation, air-cooled, for pressures up to 135 lbs. Portable outfits also. *Catalogue T-2047.*

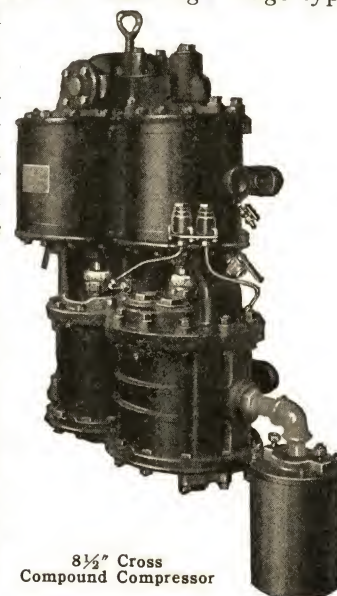


"Z" Compressor

**"Z" Type:** Two cylinder, single stage. Water-cooled for continuous operation. Pressures up to 125 lbs. Forced feed lubrication. Ball-bearing mounting of crankshaft. Unloading feature interlocked with lubricating system so that the compressor will supply air only when adequate oil supply is available. This machine may be had as a complete direct-connected motor-driven outfit, as a belt-driven unit, or with shaft extension for power take-off drive. Four sizes are available: 80, 104, 120, and 157 cu. ft. displacement. A twin combination, driven by a single motor, giving a displacement up to 314 cu. ft. may also be had.

**Steam Driven Compressors:** This line includes single stage and compound machines. The single stage type is made in three standard sizes, 8, 9½ and 11 ins., with displacements of 35, 49, and 66 cu. ft., normally for 80 lbs. air pressure and 100 lbs. steam pressure. Other sizes for special steam and air requirements. *Catalogue T-2036.*

Cross compound compressors are of larger capacity, have higher efficiency, and are more economical in use of steam. The 8½ in. 120 cu. ft. is for 160 lbs. steam and 140 lbs. air. The 8½ in. 150 cu. ft. is for 200 lbs. steam and 140 lbs. air. The 10½ in. 150 cu. ft. is for 100 lbs. steam and 80 lbs. air. *Catalogue T-2037.*



8½" Cross Compound Compressor

**Accessories:** We also make a complete line of accessories: First, those that are essential to every compressor installation—such as governors, reservoirs, air gages, safety valves, and cut-out cocks. Second, those that may be needed for various classes of air actuated apparatus—such as operating valves, hose connections, blowing nozzles, air cylinders, and a distinctive type of air signal called the "Pneuphonic Horn."

Our "WABCO" packing cups and gaskets, made of a special composition, are much superior in effectiveness and durability to those made of ordinary rubber or leather. They are available in a wide range of types and sizes for all sorts of pneumatic devices. *Catalogue T-2035.*



# WHITING CORPORATION

COMBUSTION DIVISION

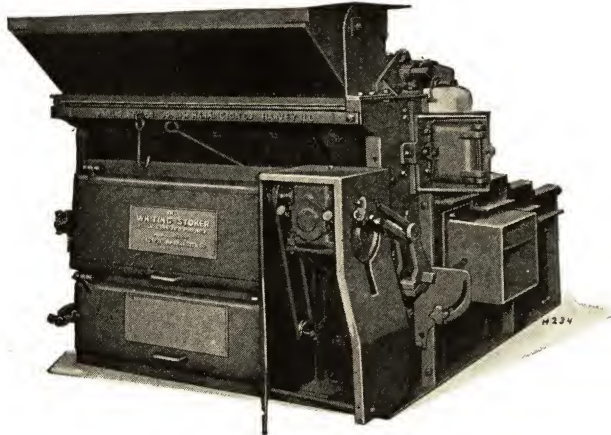
15627 LATHROP AVENUE, HARVEY, ILL.

(Chicago Suburb)

Representatives in All Principal Cities

## PRODUCTS:

A complete line of STOKERS and PULVERIZING EQUIPMENT for firing boilers (up to 5000 h.p.), including: Horizontal Compression Feed Stokers, Underfeed Stokers for the smaller size boilers, Impact Pulverizers, Table Roller Pulverizers, Pulverized Coal Conveying and Feeding Equipment, Burners, etc.



Model "A" Stoker—Standard Style

Eight sizes: guaranteed burning rates range from 300 to 1800 lb. per hour

## Other Important Features:

Continuous and automatic ash discharge.

Even and controlled fuel bed.

Smokeless, progressive combustion.

No clinkers—no waste.

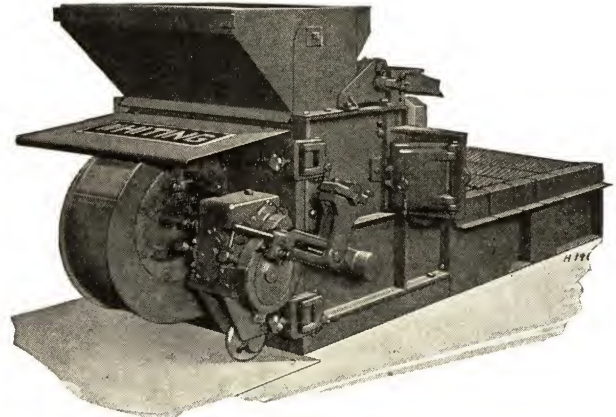
No working of fires.

High efficiencies on low-priced coals.

Applicable to old boilers.  
Low power consumption.  
Forced or natural draft.  
Lowest cost per developed horsepower.

Constant uniformity of results.

Rugged construction.  
2000 successful installations.



Model "C" Stoker—Lowset

Eight sizes: guaranteed burning rates range from 300 to 1200 lb. per hour. Requires minimum headroom; very suitable for installation under old boilers

## WHAT EQUIPMENT TO SELECT:

In the choice of any given equipment recommended to the buyer, Whiting engineers are governed entirely by the requirements of the individual job. Our line is sufficiently diverse to permit impartial selection.

## HORIZONTAL COMPRESSION FEED STOKERS:

The distinctive principle of both the standard (Model A) and lowset (Model C) Whiting Stokers is horizontal compression feed. By means of movable grates the coal moves at an even rate from the hopper to the combustion zone, where it is completely burned, and the resulting ash automatically discharged into the ash pit. Air for combustion comes up through the grates.

No other stoker utilizes so fully the important principle of progressive combustion. The entire combustion process is carried out automatically, without violent disturbance of the fuel bed, without loss of fuel and with the lowest possible attention of the fireman.

**Fits All Types of Boilers:** Both Model "A" and Model "C" Stokers are ideal for steam boilers of practically all types, ranging from 50 to 300 hp.

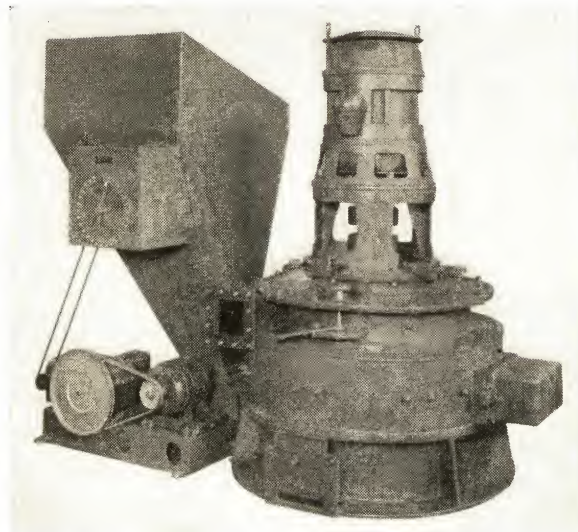
**Burns All Coals:** Exhaustive engineering tests prove the Whiting Stoker's ability to burn practically all kinds of coal. It has been especially successful in handling the low-priced western coals—Illinois, Indiana and Iowa—at great savings.

## UNDERFEED STOKERS:

We also make a complete line of underfeed stokers for the smaller commercial and industrial installations, also for homes.

## IMPACT PULVERIZER (AIR SEPARATION):

This mill (shown in cut below) is recommended for the smaller sizes of steam boilers to be fired by pulverized coal. It requires a very small amount of floor space, is readily installed with old boilers with a minimum of change and operates economically. The coal is pulverized by impact with the revolving beaters. Complete units furnished, consisting of pulverizer, blower or fan, feeder, piping, burners, etc.



No. 30-A Impact Pulverizer (Air Separation)

## TABLE ROLLER PULVERIZER:

This is a slow-speed pulverizer, suitable for use on large boilers as in central stations. Coal is pulverized by passing under large rollers forced against single piece track by spring pressure. The use of air separation principle insures uniform pulverization. Coal is dried while it is pulverized. Power consumption on this type mill is 50% lower than any other type of pulverizer. A rugged design that has proved its worth. Capacities range from 5000 to 24,000 lb. per hour.



# WHITING CORPORATION

15627 LATHROP AVENUE, HARVEY, ILL.

(Chicago Suburb)

*Cranes of All Types*

*Also Foundry Equipment, Pulverizing and Combustion Equipment, Stokers, Railroad Equipment, Evaporators and Special Machinery*

Representatives in Principal Cities

## PRODUCTS:

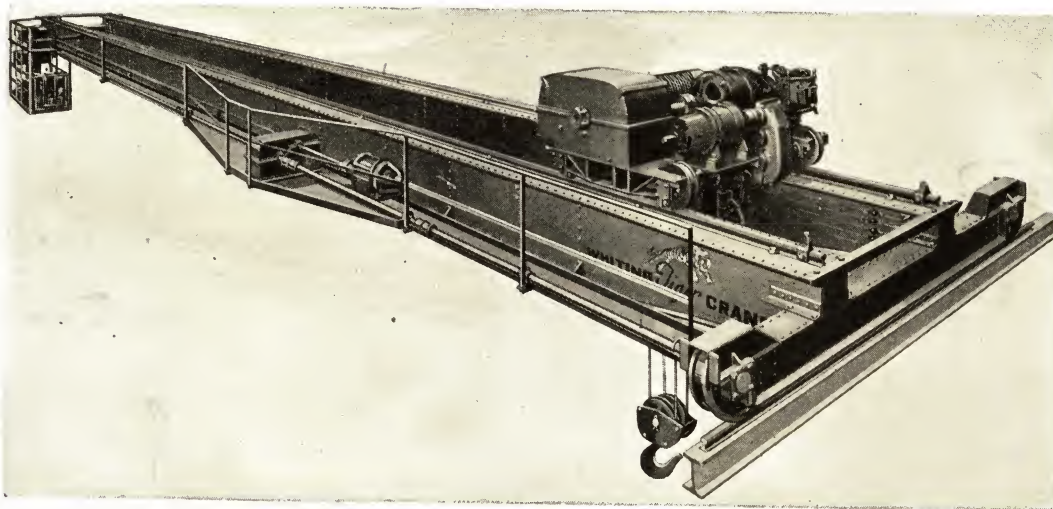
**CRANES:** Electric Traveling Cranes; Bucket Cranes; Magnet Cranes; Gantry Cranes; Cupola Charging Cranes; Powerhouse Cranes; Railroad Cranes; Low Head-room Handpower Cranes; Jib, Pillar, and Bracket Cranes.

"Safety first" all-enclosed switchboard. Every other possible safety device.

No overhung gears.

All parts quickly accessible. Standard parts carried in stock.

Flexible design, adaptable to all conditions. Compact, low-headroom design, high lift of hook, and small end clearance a feature of this crane.



"Tiger" Electric Traveling Crane

## ELECTRIC TRAVELING CRANES, 3 TO 350 TONS:

WHITING CORPORATION has built cranes of every capacity and for every class of service, inside and outside. Practically any span; alternating or direct current; cage or floor control. Trolleys may be arranged for handling clamshell bucket or lifting magnet.

## WHITING TIGER ELECTRIC TRAVELING CRANE:

The Tiger Crane is characterized by endurance, low power-consumption, slight maintenance expense, smooth and dependable operation, and faster, better crane service. It is the result of over forty years' successful experience in crane-building. Note the following features of superiority:

Herringbone gears—but two gear reductions, smooth, quiet, more efficient, longer wearing.

One-piece steel frame for all bearings in each gear train—permanent gear alignment.

Hyatt roller bearings on all gear and wheel shafts.

Oil-flushed mechanical brake. Oil pumped into brake by meshing of nearby gear reduction.

Complete oil-bath lubrication for gears and gear bearings. Alemite lubrication for other than gear bearings.

Welded, oil-tight gear housings, removable cover.

Steel trolley frame welded into one piece.

Steel end trucks welded into one piece.

Strong, well diaphragmed girders.

All-steel diamond tread footwalk, and handrail, full length of bridge.

Bridge drive by compact gear unit located at center of span; squaring shaft coupling attaches direct to axle wheel bearings.

## GANTRY CRANES:

Various styles; any capacity or span, with or without cantilever extension at one or both ends. Rugged, well-braced bridge construction; vertical and horizontal drive shafts held in a single casting bearing.

## RAILROAD CRANES:

Overhead travelers for locomotive and coach shops, any capacity or span. Gap type construction saves headroom.

## STEEL MILL CRANES:

Built to customer's specifications or from own designs.

## HANDPOWER TRAVELING CRANES:

Low headroom design with Hyatt roller bearings. Any capacity.

## JIB CRANES:

All types, handpower, pneumatic or electric.

## PILLAR CRANES:

Various styles for inside or outside service—handpower, pneumatic or electric.

## CATALOGUE:

Send for *Catalogue 214*.



# L. J. WING MFG. CO.

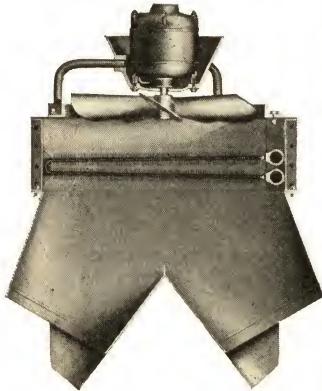
57 SEVENTH AVENUE, NEW YORK, N. Y.

WORKS: NEWARK, N. J. Branch Offices in Principal Cities

*Wing Featherweight Unit Heaters and Process Heating Units; Utility Heaters; Wing-Scruplex Safety Ventilating Fans; Fog Eliminators; Wing-Scruplex Exhausters; Wing Forced Draft Blowers, Turbine or Motor Driven; Steam Turbines; Wing Cooling Fans*

## WING FEATHERWEIGHT UNIT HEATERS

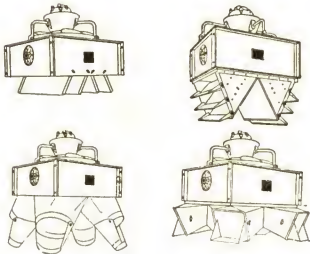
Light weight and vertical downward discharge of the heated air through high velocity multiple discharge outlets are original and unique features of Wing Featherweight Unit Heaters. Thus, downward circulation of large volumes of warmed air to the floor and its uniform distribution over the entire area are assured, with resultant economy in plant heating.



Consequently, these units produce a pleasing sense of warmth at the floor level—without drafts. Attempts to accomplish the same results by withdrawing cold air from the floor, create cold drafts, also circulate floor dust through the atmosphere.

The heating element (tested to 1000 lbs. pressure) is hairpin or return bend design. The tubes are secured to headers by a positive mechanical joint—no welding or brazing. The heating surface can be varied (in assembly) so that final air temperature is independent of steam pressure.

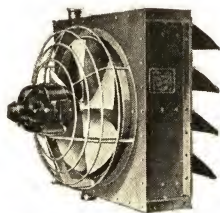
**TYPE HC UNIT**—with Design No. 8 Discharge Outlet, shown in cross section. When fitted with proper Design Outlet, these units can be located as high as 50 ft. above the floor. Eight different types of Discharge Outlets are available for this type. The heat distribution effected by these multiple Discharge Outlets, makes one heater equivalent in heat distribution, to as many as four units with single point discharge.



*Bulletin H-5.*

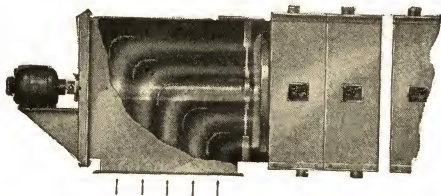
Another type known as Type LC with fan and motor below heating element is available for buildings having very low ceilings. *Bulletin H-5.*

**UTILITY TYPE UNIT**—a general purpose heater. Delivers heated air in one general direction. Fitted with vane discharge and safety guard for fan. *Bulletin U-3.*

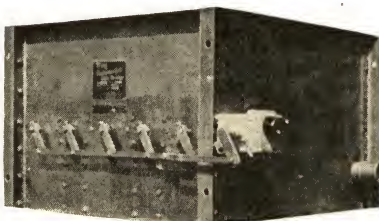


Wing Utility Unit Heater

**WING FEATHERFIN TYPE P HEATING UNIT**—a compact unit combining a powerful fan and heater section, for supplying heated air for drying processes, or any other purpose requiring heated air. Motor or turbine located outside of air current. *Bulletin P-2.*



Wing Featherfin Type P Heating Unit



Variable Temperature Featherfin Heater Section

**TEMPERATURE FEATHERFIN HEATER SECTIONS**—obtainable separately for general heating and process work, or in combination with Wing Featherweight Unit Heaters, Wing Utility Unit Heaters and Wing Featherfin Type P heating Units. These sections will deliver air at any temperature from the maximum ob-

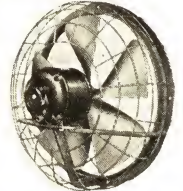
tainable, with prevailing steam pressure down to the temperature of entering air. Invaluable in supplying fresh air for space heating, also various processing work where close control of temperature must be maintained. *Bulletin VT-1.*

## WING-SCRUPLEX SAFETY FANS

The Wing-Scruplex Safety Fan was designed to fill the demand for a propeller type fan that would deliver air against static pressure, quietly, efficiently and safely.

The screw-design propeller moves the air forward in straight lines without eddy, thus assuring high static efficiency, while the welded steel safety guard affords full protection without reducing the fan efficiency. Motors are fully enclosed, generously proportioned, and readily accessible. Pulley or turbine-driven units are also available.

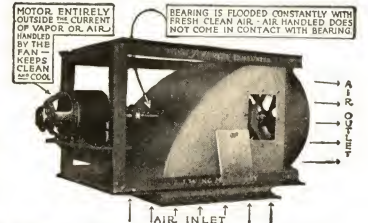
Wing-Scruplex Safety Fans, available in sizes 10" to 60" and capacities range from 950 cfm. to 52,000 cfm. They are standard equipment in all Wing heaters, Exhausters, etc. *Bulletin F-5.*



## WING-SCRUPLEX EXHAUSTERS

In the Wing-Scruplex Exhauster (used with duct work) the motor is located outside, therefore, is easy of access, clean and cool. As an elbow in any duct system, these exhausters are efficient, low in cost and easily installed. For acid-laden air, fan and exposed parts can be supplied in Monel metal.

They are made for either horizontal or vertical operation, top, bottom or side intake. Capacities up to 43,000 cfm. They can also be supplied with pulley, or steam turbine drive. *Bulletin E-8.*



## WING FORCED DRAFT BLOWER SYSTEM

This equipment is widely used:

- (1) To take advantage of the low-cost fuels available;
- (2) To step up the capacity of boilers where loads fluctuate or where the draft is inadequate.

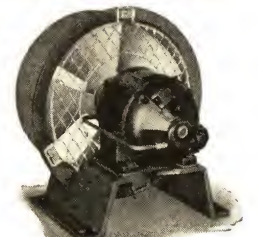
Easily installed on any boiler, it makes possible the use of the small sizes of anthracite coal (buckwheat, rice, screenings, etc.) or slack coals, affording savings of 40% to 60% as compared with domestic sizes. The cost of the complete installation is usually paid for out of savings from the first heating season's operation.

The Wing System not only increases boiler capacity but raises steam pressure much more quickly. With its automatic controls, the fireman can maintain a comfortable, uniform temperature throughout the building, even on the coldest days with far less attention than with natural draft.

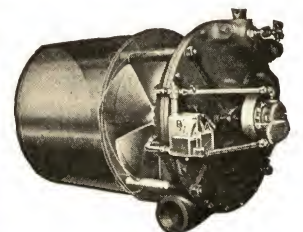
Wing Blowers are of the propeller type, affording low air velocities, quiet operation, and even distribution of air. Motors are totally enclosed and of variable speed design. Speed regulating rheostats are conveniently located near the boiler front, so that fireman can easily control his draft as he watches his fire.

Wing Systems have been installed in thousands of schools, hospitals, apartment houses, office buildings, banks, churches, etc.

For high pressure boilers (stoked, hand-fired, or oil-fired) Wing Turbine Blowers offer a simple and inexpensive forced draft installation. Placed in the boiler walls, they eliminate costly ducts and excavations, making initial cost low while giving maximum economy and steaming capacity. Sizes to develop up to 2000 hp. or more per boiler.



Motor-Driven Blower



Turbine Blower



# WORTHINGTON PUMP AND MACHINERY CORPORATION

GENERAL OFFICES: HARRISON, NEW JERSEY

WORKS: BUFFALO, N. Y., HARRISON, N. J., NEWARK, N. J.

DISTRICT SALES OFFICES AND REPRESENTATIVES

ATLANTA  
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LOS ANGELES  
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NEW ORLEANS

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ST. PAUL  
SAN FRANCISCO



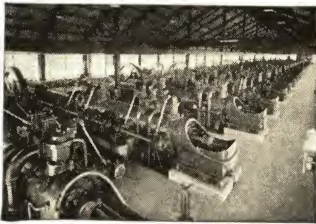
SEATTLE  
TULSA  
WASHINGTON

Branch Offices or Representatives in Principal Cities of Foreign Countries

## WORTHINGTON



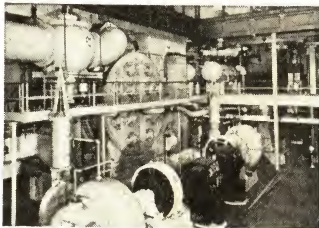
A-34149



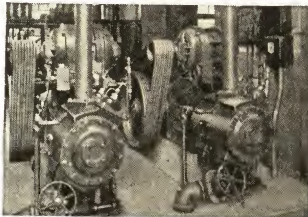
Gas Engine Compressors on Gas Pipe Line—57 Worthington Units on This Line



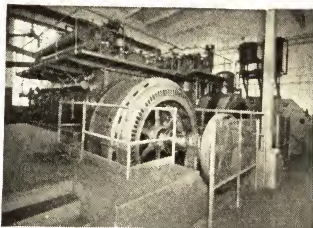
Portable Air Compressor on Field Work



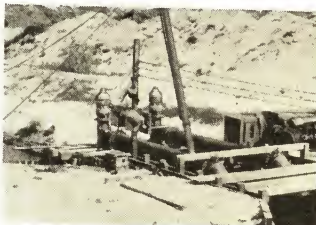
Surface Condenser Installation at Detroit Edison Power Plant



Air Compressors with Multi-V-Drives



Diesel Engines Driving Generators



Field Installation of Deep Well Turbine Pumps

### AIR AND GAS COMPRESSORS:

**Stationary:** Single and multi-stage. All sizes. Steam and power drives.

**Portable:** AIR KING—on all types of mountings; gasoline engine and electric motor drive.

### REFRIGERATION EQUIPMENT:

Compressors for ammonia, carbon dioxide, freon, and other refrigerants; all sizes and types for all classes of drive. Unibloc Diesel and gas engine compressors. Vacuum (steam jet) equipment for cooling buildings and manufacturing processes.

### ROCK DRILLING EQUIPMENT:

Rock hammers, drifters, drills, etc. Forging furnaces and heat treating machines for drill steel.

### CONTRACTORS AIR TOOLS:

Clay spades, trench diggers, tampers, pavement breakers, etc.

### DIESEL ENGINES:

Vertical 4-cycle direct-injection type, for general service, driving generators, and marine propulsion.

### GAS ENGINES:

Horizontal double-acting and vertical single-acting, for power or gas compressor service.

### MULTI-V-DRIVES:

Goodyear rubberized cord belts operating in V-grooved sheaves. Belts, or complete drives.

### STEAM CONDENSERS:

Surface, barometric and jet types for all ranges of capacity. Complete systems with vacuum pumps, steam-air ejectors, etc.

### FEEDWATER HEATERS:

Open type—water heated by direct contact with steam—purified and deaerated.

### PUMPS:

**Steam Pumps:** Reciprocating direct-acting and flywheel types; simplex, duplex, duoplex; horizontal and vertical; piston and plunger; simple and compound; for all liquids and services.

**Centrifugal Pumps:** Volute and turbine; single and multi-stage; for all liquids and services.

**Power Pumps:** Horizontal, vertical; single, duplex, triplex; piston, plunger; for all liquids and services.

**Rotary Pumps:** Positive displacement; for non-abrasive and non-corrosive liquids.

**Deep Well Turbine Pumps:** For electric motor, belt or steam turbine drive.

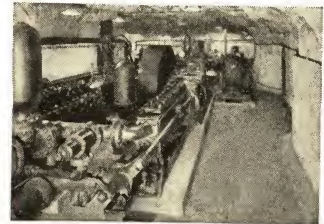
**Sump Pumps:** For intermittent drainage of tanks, pits, etc.

**Irrigation and Drainage Pumps:** Axiflo and centrifugal non-clogging types for farmlands, dry docks, bogs, etc.

### METERS:

For hot or cold water, hot or cold oil, gasoline, grease. Disc, turbine, compound and piston types.

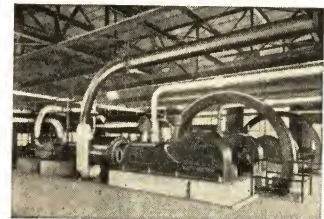
*Literature covering any of the above products will be sent on request. Address nearest district office or representative.*



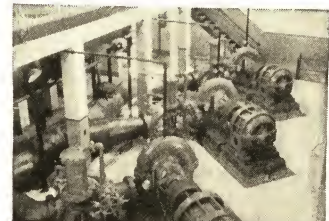
Duplex Pumps on Mining Service at Hurley Mine of Montreal Mining Co., 2000 Ft. Below Ground



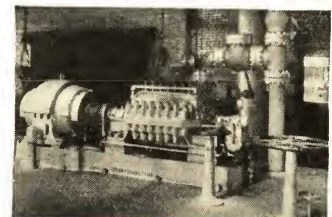
Opposed-Type Compressors on Gas Distribution



Crank-and-Flywheel Pumps for Hot Oil. 26 Worthington Units Operated by This User



3-20M Gal. Centrifugal Pumps of the Duluth, Minnesota, Waterworks



7-Stage Centrifugal Boiler Feed Pump



Hivol Steam Pumps in Modern Refinery



# WRIGHT MANUFACTURING DIVISION OF AMERICAN CHAIN COMPANY, INC.

YORK, PENNSYLVANIA

*Manufacturers of Hand Operated Hoists, Electric Hoists, and Cranes*

## HOISTING AND CONVEYING EQUIPMENT

High Speed Hoists  
Army Type Trolley Hoists  
Special Low Headroom Hoists  
Twin Hook High Speed Hoists  
Extended Handwheel Hoists  
High Speed Hand Winch  
Standard Screw Hoists  
Differential Hoists

Wright Electric Hoists  
Wright Motor Driven Trolleys  
Timken and Self-Aligning Roller Bearing Trolleys  
Malleable Iron Trolleys  
Double Beam Timken Trolleys  
Hand Traveling Cranes

## WRIGHT HIGH SPEED HOIST

### Improved Model

The Wright High Speed Hoist is recommended where heavy loads must be lifted quickly and easily. Its design, ruggedness, and precision of manufacturing mean long life—50 to 100 per cent longer life than the ordinary spur geared hoist.

All exposed parts are zinc coated.

The main driving spindle and load wheel shafts run on ball bearings which greatly reduces wear at these vital points. The hoist is easily oiled—spring covered oil tubes go to all vital parts.

A Timken Tapered Roller Bearing at the lower swivel hook prevents the load chain from becoming twisted. Thus, the load chain always rides squarely into the load wheel pockets. This feature reduces wear, insures against unevenness of motion, and eliminates all possibility of break due to a shock load on a twist.

A new patented load chain guide completely shrouds the upper half of the load sheave—another Wright safety feature which prohibits the load chain from ever riding out of the load pockets, a condition that might have serious results. It also protects the load pockets from dust and dirt.

The load chain is of special analysis steel to give great strength and long life. Each link is electrically welded on the side, and is die formed to assure evenness of pitch.

A loop hand chain guide prevents the hand chain from fouling.



## WRIGHT SCREW HOIST (Model 30)

The Wright Screw Hoist, Model 30, is a light and durable hoist, which requires a minimum of headroom.

The hoist is recommended for general repair work, where it must be continually carried about and operated in different places. It is adaptable to work on the horizontal—moving loads on rollers or skids, etc.

It is designed on the worm wheel and screw principle, is of few parts, and of extremely simple construction. All working parts are enclosed on a sealed dust-proof housing, packed with a special grease to insure years of service without undue wear.

The hoist will hold its load indefinitely at any point.

## WRIGHT DIFFERENTIAL HOIST

The Wright Differential Hoist is recommended where a hoist will be used infrequently and where conditions are such that a highly efficient hoist, such as the Wright High Speed Hoist, is not necessary.

It is a light weight, simple and reliable hoist that can be depended upon at all times. Its speed compares with the High Speed Hoist, but the effort to raise the load is nearly three times as great.

Although the Wright Differential Hoist is low in price, it is not a cheap hoist. In fact, the design and materials are the best possible. It is constructed with extra-heavy load sheaves, malleable iron yokes, and heat-treated, drop-forged hooks.

The load chain is made of special analysis steel and the chain meshes perfectly in the carefully formed load pockets.

The hoist will hold its load indefinitely at any point.



## WRIGHT-WAY HOIST

The Wright-Way Hoist is a refinement of the differential type. When lifting the wheels operate on ball bearings which reduce friction to a minimum. A roller bearing lower swivel hook prevents the lower sheave from twisting so that the chain always rides squarely in the load wheel pockets, eliminating unnecessary wear and resulting in easier operation.

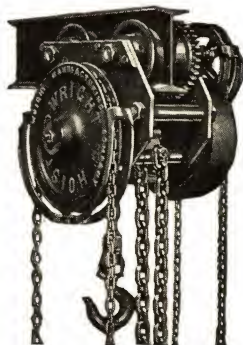
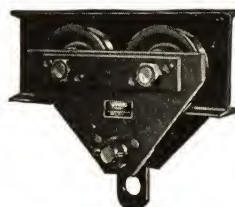
Load wheel pockets are precision formed so that the electrically welded die formed chain fits them perfectly. The Wright-Way Hoist operates so easily that a ratchet is provided to prevent the load from lowering too rapidly. There are no springs or delicate parts to get out of order. This hoist will outwear the ordinary differential hoist in addition to providing for easy and quick lifting.



## WRIGHT TIMKEN TROLLEYS AND ARMY TYPE TROLLEY HOISTS

Wright Timken Tapered Roller Bearing Trolleys are constructed with heavy steel side plates and chilled tread wheels, which revolve on Timken Bearings thus giving the trolley extreme durability and ease of operation.

The Wright Self-Aligning Roller Bearing Trolley (a trolley identical to the Timken except for the bearings) can be furnished.



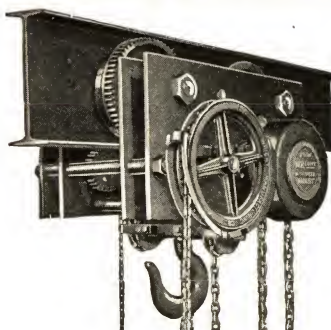
The Wright Army Type Trolley Hoist is constructed by building a Wright High Speed Hoist into a Wright Timken Tapered Roller Bearing Trolley and embodies all the exclusive features of both.

It is recommended for installations where headroom is limited and where a combined trolley and hoist are desirable.

## WRIGHT LOW HEADROOM TROLLEY HOIST

The Wright Low Headroom Trolley Hoist, Type 600, is a special purpose hoist built for use where headroom is so limited that no other type of Wright Hoist and Trolley is adaptable. Because of its design for unusually low headroom installations, it is somewhat limited in flexibility. However, it embodies the features of the Wright High Speed Hoist and Timken Bearing Trolley for efficiency and ease of operation.

The trolley is constructed with steel side plates and equipped with Timken Tapered Roller Bearings. The hoisting mechanism is similar to that of the regular Wright High Speed Hoist. The minimum distance between bottom hook and I-beam on the 10 ton size is just 13 inches.





# THE YALE & TOWNE MANUFACTURING CO.

PHILADELPHIA DIVISION  
PHILADELPHIA, PA.

*Materials Handling Equipment*

## PRODUCTS

YALE HAND CHAIN HOISTS, ELECTRIC HOISTS, HAND and MOTOR-DRIVEN TROLLEYS, SINGLE I-BEAM CRANES, ELECTRIC INDUSTRIAL TRUCKS, HAND LIFT TRUCKS and SKID PLATFORMS.

### YALE BALL BEARING SPUR GEARED CHAIN HOISTS

*1/4 to 40 Ton Capacities*

These powerful hoists, made by the world's oldest and largest manufacturers of hoisting equipment, are the safest as well as the speediest and most efficient of all hand hoists, because they are

*"From Hook to Hook a Line of Steel"*

Heavy duty chrome vanadium steel ball bearings; steel load sheave; heavy one-piece heat treated and ground driving pinion; planetary gear systems; die-formed, electrically welded load chain; heavy steel suspension plates; adjustable continuous hand chain guides; drop forged detachable steel shackles and special steel safety hooks.

### YALE SCREW GEARED CHAIN HOISTS

*1/2 to 5 Ton Capacities*

Suitable for horizontal as well as upright service because they are light and portable, as well as strong and durable. Operate on worm wheel and screw principle and provide close headroom.

### YALE DIFFERENTIAL CHAIN HOISTS

*1/4 to 2 Ton Capacities*

Designed to meet ordinary hoisting needs where the speed and power of the spur geared and screw geared types are not required. Especially suitable for service where loads are comparatively light.

### YALE STEEL PLATE TROLLEYS

*Plain and Geared Types*

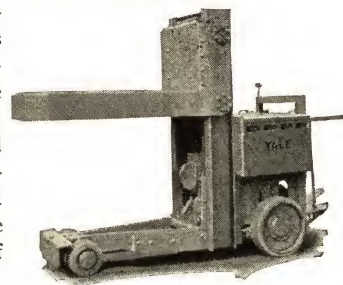
Strong, easy-running, with an ultimate strength of seven times their rated capacities. They traverse short radius curves easily without binding; non-rigid construction allows wheel flanged to take positions suited to the curve and slope of the I-beam flange. Dust-tight, self-oiling, equalizing roller bearings, heat-treated, hardened and ground, assure easy lateral motion.

TRADE **YALE** MARK

### YALE K25, HIGH LIFT TRUCK

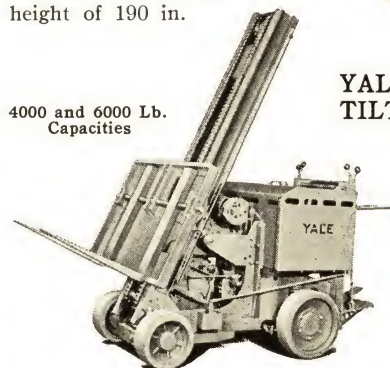
*6000 Lb. Capacity*

This Yale Electric Truck, because of its high lift, combines the advantage of stacking with those of lifting and hauling. It is built to a standard overall height of 83 in. which permits it to lift the load to a height of 62 in. Also made with platform elevation of 169 in. and overall height of 190 in.



### YALE K31A, HIGH LIFT TILTING FRAME TRUCK

This truck picks up loose and bulky loads directly from the floor and transports them in a safe tilted position for warehouse stacking. It is built in two standard capacities.

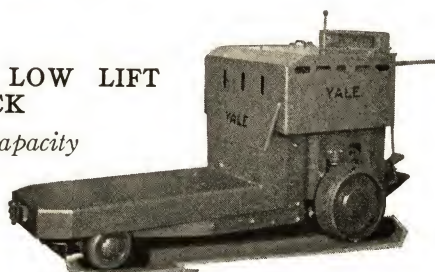


4000 and 6000 Lb. Capacities

### YALE K23E-6, LOW LIFT TRUCK

*6000 Lb. Capacity*

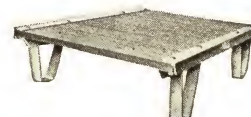
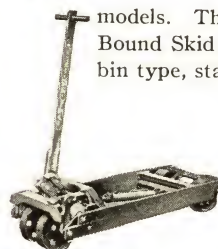
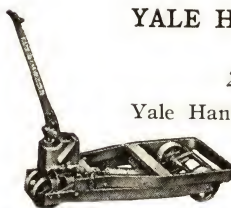
A low platform lift truck designed for transporting skid platform loads of materials in every classification of industry. Like all other Yale Electric Trucks, it is powerful and durable, safe, easy to operate. It saves time and money in the lifting and hauling of materials.



### YALE HAND LIFT TRUCKS AND SKID PLATFORMS

*2500 to 20,000 Lb. Capacities*

Yale Hand Lift Trucks (formerly Stuebing-Cowan line) are made in an extensive range of sizes, types and capacities to meet every industrial requirement. There are single stroke and multiple stroke lift models. There is a variety of types of Yale Steel Bound Skid Platforms including the flat type, sectional bin type, stake pocket type, slat bin type and others.



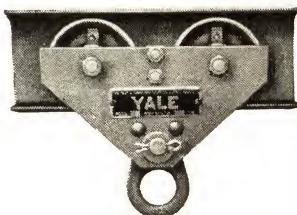
Spur Geared Hoist



Screw Geared Hoist



Differential Hoist



Steel Plate Trolley

**IMPORTANT**—All Yale Hoists are tested to 50% overload—long ton rating 2240 lbs.



# YARNALL-WARING COMPANY

7603-20 QUEEN ST., CHESTNUT HILL, PHILADELPHIA, PA.

Manufacturers of YARWAY Steam Specialties

## BRANCH OFFICES

ATLANTA

BOSTON

CHICAGO

CLEVELAND

DETROIT

KANSAS CITY

NEW YORK

PITTSBURGH

DENVER  
EL PASO

HONOLULU  
LOS ANGELES

SALES REPRESENTATIVES (NAMES ON REQUEST)

MANILA  
PORTLAND, ORE.

SAN FRANCISCO  
SEATTLE

SPOKANE  
TORONTO

WINNIPEG

## YARWAY PRODUCTS:

Blow-Off Valves  
Hydraulic Valves  
Air Control Valves  
Water Columns  
Water Gages

Impulse Steam Traps  
Expansion Joints  
Spray Nozzles  
Pipe Clamps  
Pipe-Joint Clamps  
V-Notch Meters

# YARWAY

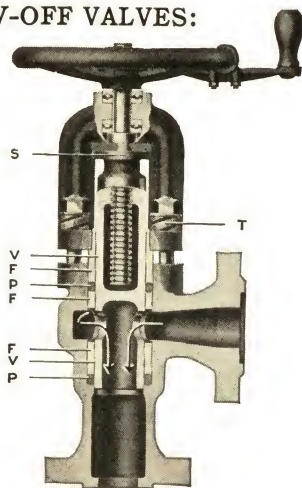
TRADE-MARK

## YARWAY SEATLESS BLOW-OFF VALVES: (No Seats to Leak):

Especially suitable for high pressure service. Used in over 10,000 plants.

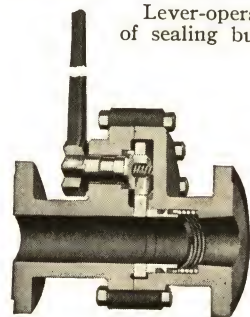
**Operation:** After valve has been closed, shoulder S on plunger V contacts with upper follower gland F, forcing this down into body and compressing packing P above and below port, making an absolutely tight valve. Yoke tension springs T maintain continuous compression on packing train. Write for celluloid working model and Blow-Off Valve Catalog B-417.

For Yarway Pretite Valves and Yarway Type P Seatless Valves for heating boiler service and for industrial process lines, send for Bulletins P-501 and P-502.



## YARWAY DOUBLE-TIGHTENING VALVES:

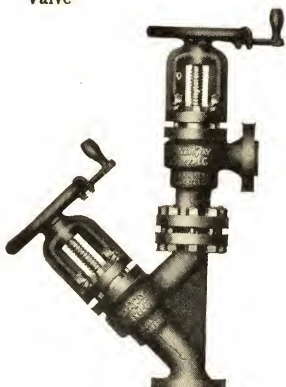
Lever-operated, swing-gate type with unique feature of sealing bushing on inlet side, making it double-tightening on both sides of gate. Made in several types, for pressures to 300 lbs., and especially suited for use in tandem with Yarway Seatless Blow-Off Valve. Write for Bulletin B-417.



Yarway Double-Tightening Valve

## YARWAY TANDEM VALVES:

The ideal combination for service on any blow-off line. Made in several types for pressures up to 2000 lbs. More of the new high-pressure plants are equipped with Yarway than with any other make of blow-off valves. Write for Bulletin B-417.



Yarway Seatless Tandem—Type for 400 to 600 Lbs. Working Pressure



Yarway Tandem—Combining Yarway Seatless and Double-Tightening Valves for Pressures of 200 to 300 Lbs.

## YARWAY EXPANSION JOINTS:

(Wrought Steel, Cylinder Guided, "Gun-Pakt"):

An all steel guided expansion joint adaptable to practically every condition where expansion due to changes in temperature of high or low pressure steam mains, hot liquid lines, etc., must be met

Features recommending it for use in conduits and inaccessible locations are: (1) All steel welded construction—light and strong.

(2) Cylinder-guided, chromium-covered steel sliding sleeve. Cylinder guide and stuffing box integral, insuring perfect alignment.

(3) Sliding sleeve away from inside bottom of body dirt pocket. (4) Large, deep stuffing box. (5) Easily accessible packing gland. (6) Diameter smaller than that of pipe flange. (7) Substantial internal limit stops.

Made in standard and extra heavy types. Supplied with standard glands or with special GUN-PAKT Glands which permit packing joints while under normal steam pressure. All sizes furnished in double type with base and in single type both with and without base. Small size joints also supplied in brass. Details of all types in Bulletin EJ-1904.

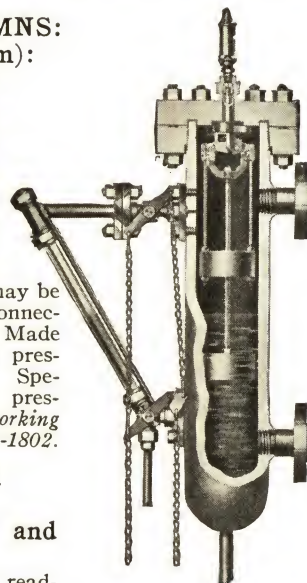


Yarway Cylinder Guided Expansion Joint. Double Type with Base. All Steel-welded

## YARWAY WATER COLUMNS: (With Floatless Hi-Lo Alarm):

Depends for its action upon displacement of solid weights.

Whenever high or low water levels destroy the equilibrium of the weights a valve opens admitting the steam to the alarm whistle. If desired, a mercury electric switch connected to warning light or bell may be used instead of, or in connection with, the whistle. Made in types for all boiler pressures up to 1350 lbs. Special types for higher pressures. Write for working model and Bulletin WG-1802.



Yarway Floatless Hi-Lo Alarm Water Column with Yarway Se-Sure Inclined Water Gage

## YARWAY WATER

### GAGES:

(Se-Sure Inclined and Vertical):

Inclined water gages facilitate readings from any point on the boiler room floor, even directly beneath. Made for pressures up to 600 lbs. Vertical gages are made for pressures up to 1350 lbs. Yarway gages using mica-protected flat glass steel inserts with drop forged cover plates are equipped with a condensate guide which prevents erosion. Bulletin WG-1802.

## YARWAY SPRAY NOZZLES:

(Involute Types, Klein Patents):

No internal vanes, deflector plates, or other parts to clog and wear. Inexpensive both in first cost and maintenance. Operates successfully under low pressure. Ideal for recooling, air conditioning, aeration and industrial processes. Details of all types in Bulletin N-613-A.





## AMERICAN GAS FURNACE CO.

ELIZABETH, N. J.

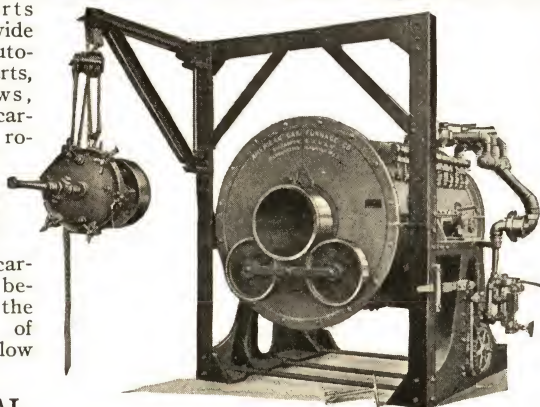
*Industrial Furnaces, Heating Machines, Carburizing Machines, Melters, Pot Furnaces, Burners, Textile Appliances*

For more than half a century we have been pioneering. The complete line of gas furnaces we now make is the direct result of research and development. We are now prepared to supply equipment for practically every known heating requirement of proved quality and efficiency. This equipment accomplishes superior results at a definite saving.



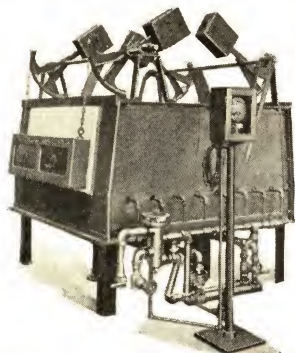
### ROTARY CARBURIZERS

Balls, rollers and races for anti-friction bearings, chains and chain parts and a wide variety of automotive parts, cap screws, etc., are carburized in rotary retort carburizers, using either gas or compound for carburizing, because of the uniformity of results and low cost.



### VERTICAL RETORT CARBURIZERS

Parts which cannot be rotated such as gears, large races, shafts, etc., are carburized in vertical retort furnaces because of uniformity of results, elimination of packing and over-all reduction in cost.

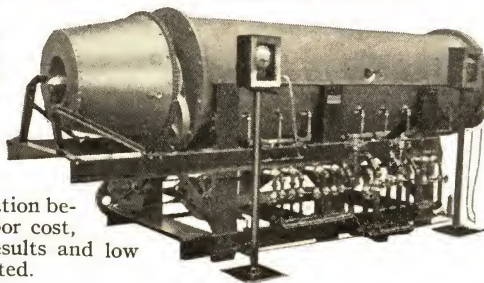


### OVEN FURNACES

American oven type furnaces are of advanced design. They are well insulated, lined with best grade refractories and equipped with burners to obtain uniform heating and accurate combustion control.

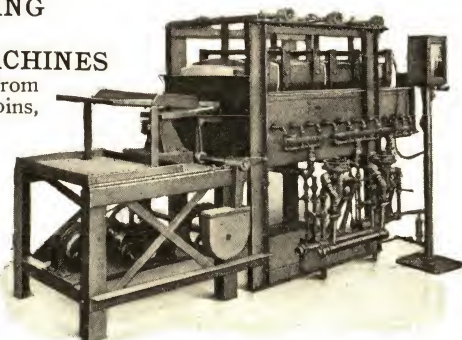
### ROTARY RETORT CONTINUOUS HEATING MACHINES

These machines are made in various sizes for quantity heat treating of small and medium sized parts. They find wide application because of low labor cost, uniformity of results and low cost of work treated.



### RECIPROCATING HEARTH HEATING MACHINES

Parts ranging from needles, small pins, etc., up through a wide variety of springs, stampings, ball races and heavy pins are satisfactorily handled in this Reciprocating Hearth Heating Machine.



## AUTOMATIC PRIMER CO.

28 NORTH CLARK ST., CHICAGO, ILL.

### PRODUCTS

Apco Automatic Primers for Centrifugal Pumps; Air Relief Valves, Boiler Feed Pump Regulators, High Pressure Steam Traps, and Air Traps.

### THE APCO AUTOMATIC PRIMER

The Apco Primer is a simple tank and piping system, without moving parts or anything to get out of order. Its operation is entirely automatic and requires no attention. It does not affect the characteristics of the pump to which it is connected. Operates on suction lines of any length, against any head, at any capacity.

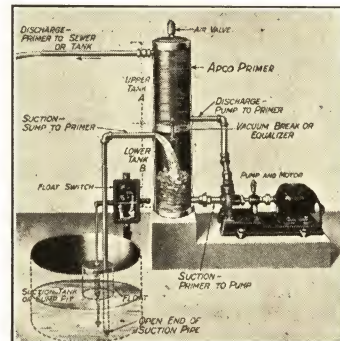
**Advantages:** (1) Costs but little to install, and nothing to operate.

(2) It is entirely automatic and dependable.

(3) Permits using unsubmerged horizontal centrifugal pumps placed where handiest to get at.

(4) Use of the Apco does not require the use of the vertical thrust bearings and foot valves which so often give trouble in other types of installations.

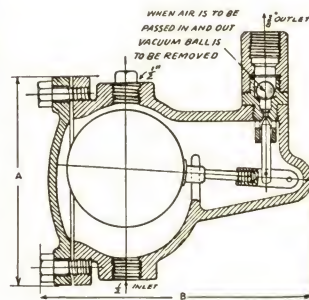
(5) Automatic operation permits remote pump control, very often desirable, as in sump pumping and in water supply systems for towns, estates, golf courses, paper mills, steel mills and similar applications.



### APCO AIR RELIEF VALVES

Apco Valves release air or vapor from pipe lines, water mains, tanks and pumps and are made in a variety of sizes suitable for the smallest condition up to the maximum requirements for air removal, and for pressures from 0 to 500 lb. per square inch.

Apco Valves are used for maintaining constant levels, and on centrifugal pumps where Vacuum Primers are used. A special line of compound leverage Valves is designed for high pressures and large capacities, and for use on gasoline and oil lines and vessels.

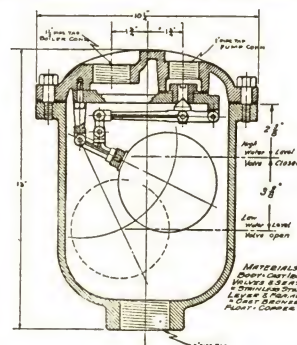


Valve No. 55  
For Pressures up to 175 Lb.

### APCO BOILER FEED PUMP REGULATORS

This Regulator is the most simple device for regulating a steam boiler feed pump on a single boiler installation. It is especially suited for portable units, for drilling rigs and for creameries, laundries, dry cleaning plants and other single boiler plants.

This regulator has no stuffing boxes or outside levers to cause trouble, and will maintain a constant water line without fluctuation by feeding steam direct to the feed pump in exact proportion to the demand on the boiler. Compound leverage furnishes the power necessary to open large orifices against boiler pressures.



For Pressures up to 250 Lb.  
Boiler H. P. up to 250

Write for catalogue No. MC30 with complete description and specifications for APCO Products.



# NATIONAL METER COMPANY

Established 1870

4207 FIRST AVENUE, BROOKLYN, N. Y.

## BRANCH OFFICES

CHICAGO, ILL. . . . . 1455 West Congress St.  
BOSTON, MASS. . . . . 368 Congress St.

SAN FRANCISCO, CAL. . . . . 1048 Folsom St.  
DALLAS, TEXAS . . . . . 1208 Dallas Bank and Trust Bldg.

## PRODUCTS

Meters for all liquids, including meters for all liquid petroleum products. Meters for all refinery purposes, loading racks, bulk stations, tank trucks, etc. Meters for special as well as standard applications—for the usual pressures or for high-pressure service, as required. Gasoline and fuel oil meters. Testing meters for checking weights, calculations, measures, or the flows of other meters, including complete design and equipment of meter testing plants. Water meters for all purposes, including all municipal, domestic, and industrial applications.

### EMPIRE OIL METERS

This original meter of the oscillating piston type—the EMPIRE meter—is still unequalled for permanent accuracy and economy of operation. It is, we believe, by far the simplest and most accurate of all true displacement meters. The EMPIRE piston does not circulate as in a rotary design, nor nutate like a disc. It *oscillates*, easily and with practically no friction whatever, on the bridge of a circular measuring chamber. Its motion is always forward—in the same direction as the flow of the liquid—and the measuring chamber is emptied at each oscillation. The design is such that the weight of the piston is largely supported by the liquid itself, almost floating in the measuring chamber, and its contact with the walls of this chamber is so light, and the pressure is so evenly balanced, that friction is almost completely eliminated. Whatever slight wear does occur can be adjusted easily and at minimum cost. It should be noted that the balanced type of piston described above is not obtainable in any meter excepting the EMPIRE meter, which is made only by the National Meter Company. This meter is entirely different in design from all other types. It is well known and widely used throughout the world.

**For All Petroleum Products:** The EMPIRE oil meter is the most accurate and economical meter obtainable for the measurement of gasoline, fuel oil, and all other liquid petroleum products. It is used in refineries everywhere for a great variety of purposes. Standard types are furnished for working pressures up to 150 lb. per sq. in.; high-pressure types up to 325 lb. or, on special order, for still higher pressures. EMPIRE oil meters are made either with straight reading horizontal register (illustrated) or with a large vertical dial fitted with a set-back mechanism by which the hands can be turned back to zero after any run, without disturbing the total of all runs, the total being shown in a straight line of figures in the lower part of the dial. The dial can be turned to face in any one of four directions. EMPIRE meters are furnished to

read in cubic feet, liters, gallons, or other units of measure, as required.

In addition to refinery uses, EMPIRE meters are widely used in bulk stations and other marketing services, including tank trucks.

The advantages of metering at various points in the marketing of gasoline, fuel oil, lubricating oil, etc., are universally conceded. It is obvious, however, that metering to be profitable must meet two essential requirements, namely, permanent accuracy and economy of maintenance. These are the outstanding advantages of the EMPIRE meter, as can be proved by reference to users in all branches of the industry.



Empire Meter with Vertical Dial



Straight Reading Register



Empire Piston and Chamber

### EMPIRE METERS FOR OTHER LIQUIDS

EMPIRE meters are used successfully for measuring liquid chemicals, tanning extracts, brine, glycerine, ink, printing ink, syrups, fruit juices, beverages, spirits, and many other valuable liquids. For any engineering project involving close measurement of any liquid product, this meter will be found practical, accurate, and dependable.

### EMPIRE AND OTHER WATER METERS

Six types of cold water meters, made in all wanted sizes, are included in the National Meter Company's line, as follows: (1) EMPIRE  $\frac{5}{8}$ " to 6". (2) CROWN, also a positive displacement meter, but of the rotary piston type, practically indestructible,  $\frac{5}{8}$ " to 6". (3) NASH, a disc meter, the best of this familiar type,  $\frac{5}{8}$ " to 6". (4) GEM, a velocity meter, has the largest capacity of any meter of this type, and is also the strongest, 2" to 12". (5) EMPIRE-COMPOUND, for widely varying flows, combining the extraordinarily accurate EMPIRE and the capacious GEM, with all the merits of both, 2" to 12". (6) PREMIER, a practical Venturi style meter, for measuring an entire water supply, flows of mains, or similar large-capacity service, 6" to 48".

### CATALOGUES AND SERVICE

The National Meter Company has been manufacturing meters for sixty-four years. The results of this long experience, in the form of suggestions, data, and engineering service, are available to our customers and prospective customers.

Illustrated catalogues, specifications, blue-prints, and any specific information concerning meters is obtainable from us on request. When making inquiries please specify your requirements as fully as possible, including the kind of material to be measured, its specific gravity, size of pipe, maximum and minimum quantities to be delivered per hour, maximum and minimum pressures, temperatures, etc.



# INDEX TO MANUFACTURERS OF INDUSTRIAL EQUIPMENT MATERIALS AND SUPPLIES

SERVES ALSO AS  
**INDEX TO PRODUCTS**  
DESCRIBED IN CATALOGS

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CONTAINS THE NAMES AND ADDRESSES OF 665 FIRMS  
LISTED UNDER 4000 CLASSIFICATIONS OF EQUIPMENT

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Continuing the policy started in the previous issue, this Index includes not only the names of concerns who present catalogs in the preceding pages, but also a large number of additional manufacturers serving the mechanical engineering field who have arranged for listings of their products at the nominal fee of \$1.00 per listing.

This Index will prove of great value for locating source of equipment needed by engineers and also as a guide to the detailed information appearing in the catalogs in this issue. Its accuracy is guaranteed by the fact that listings are not carried over from the last issue. Each insertion has been ordered anew and verified for this volume.

## TYPES OF LISTINGS

**Advertisers**—All concerns presenting catalogs in this issue are identified by a (★) preceding their name and have the page number or numbers of their catalog after their name to facilitate reference to descriptions of their products.

**Non-Advertisers**—This is the typical directory type of listing for firms who desire to be listed under the product that they make, but of which they do not present a detailed description.

*See Next Page for Directions*



## **Directions for Using Index**

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### **Basis of Classification**

The policy followed is to index equipment under the main noun as the key index word. On that basis such equipment as Centrifugal Pumps, Steam Engines, etc., will be found indexed as PUMPS (Centrifugal), ENGINES (Steam), etc. Exceptions to this arrangement occur in indexing general group classifications such as Machines, Outfits, Systems, etc. These are listed with the function performed as the key word. Examples are Drilling Machines under "Drilling" and Air Washing Systems under "Washing."

### **Cross References**

In cases where the equipment is equally well known under two names, or where it has been deemed advisable, firms making such equipment have all been listed under one subject heading and a cross reference inserted under the other heading or headings. As the use of general class headings has been found impractical, firms are listed only under specific headings and general headings, such as Box Making Machinery, Textile Machinery, Logging Machinery, Woodworking Machinery, etc., are used as cross references to the specific equipment.

### **Trade Names and Trade Mark Names**

As an additional aid in locating particular equipment, trade names and trade mark names of advertisers have been included. These will be found immediately after the firm name and are enclosed in quotation marks and parentheses, thus ("Acme").

### **Advertisers Products**

The recommendation is made that the Index be used in conjunction with the Catalogs, as much valuable information can be found concerning products if reference is made to the pages whose numbers are given after the firm names.



# INDEX TO MANUFACTURERS

OF INDUSTRIAL EQUIPMENT, MATERIALS AND SUPPLIES

SERVES ALSO AS

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- Falls Hollow Staybolt Co., 7 Portage Trail, Cuyahoga Falls, Ohio.

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- \*Republic Steel Corp'n, Youngstown, Ohio. 176
- Jones & Laughlin Steel Corp'n, Jones & Laughlin Bldg., Pittsburgh, Pa.
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- Ryerson, Joseph T., & Son, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Jersey City, Milwaukee, Philadelphia, St. Louis.
- Timken Steel and Tube Co., Canton, Ohio.
- Vulcan Steam Forging Co., 247 Rano St., Buffalo, N. Y.

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- \*Republic Steel Corp'n, Youngstown, Ohio. 176
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- Timken Steel and Tube Co., Canton, Ohio.

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## Bearings Industry Corp'n, 1834 Broadway, New York, N. Y.

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## BEARINGS (Lignum Vitae)

- Lignum-Vitae Woodturning Co. (Inc.), 94-102 Boyd Ave., Jersey City, N. J.

## BEARINGS (Mill Neck, Lignum Vitae)

- Lignum-Vitae Woodturning Co. (Inc.), 94-102 Boyd Ave., Jersey City, N. J.

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- \*SKF Industries (Inc.), Front St. & Erie Ave., Philadelphia, Pa. 182
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## BEARINGS (Oilless)

- Metal Saw & Machine Co. (Inc.), 40 Napier St., Springfield, Mass.

## Neveroil Bearing Co., 29-99 Foundry St., Wakefield, Mass.

## Nolu Oilless Bearing Co., 6-12 E. Johnson St., Philadelphia, Pa.

## Rhoades, R. W., Metaline Co. (Inc.), 62 West Ave., Long Island City, N. Y.

## BEARINGS (Phenolic Composition)

- Ryerson, Joseph T., & Son, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Jersey City, Milwaukee, Philadelphia, St. Louis.

## BEARINGS (Radial, Ball, Self-Aligning)

- \*Norma-Hoffmann Bearings Corp'n, Stamford, Conn. 154
- \*SKF Industries (Inc.), Front St. & Erie Ave., Philadelphia, Pa. 182

## Ahlberg Bearing Co., 321 E. 29th St., Chicago, Ill.

## Bantam Ball Bearing Co., South Bend, Ind.

## Rollway Bearing Co. (Inc.), 541 Seymour St., Syracuse, N. Y.

## Shafter Bearing Corp'n, 6501-99 W. Grand Ave., Chicago, Ill.

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- \*Norma-Hoffmann Bearings Corp'n, Stamford, Conn. 154
- \*SKF Industries (Inc.), Front St. & Erie Ave., Philadelphia, Pa. 182

## Bantam Ball Bearing Co., South Bend, Ind.

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- \*Timken Roller Bearing Co., Canton, Ohio. ....205

- Ahlberg Bearing Co., 321 E. 29th St., Chicago, Ill.
- Auburn Ball Bearing Co., 57 Clarissa St., Rochester, N. Y.
- Bantam Ball Bearing Co., South Bend, Ind.
- McGill Mfg. Co., Valparaiso, Ind.
- Nice Ball Bearing Co., 30th & Hunting Park Ave., Philadelphia, Pa.
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- \*SKF Industries (Inc.), Front St. & Erie Ave., Philadelphia, Pa. ....182
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- Bantam Ball Bearing Co., South Bend, Ind.
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- H. & O. Machinery & Engrg. Co., 280 Passaic St., Newark, N. J.
- McGill Mfg. Co., Valparaiso, Ind.
- Rollway Bearing Co. (Inc.), 541 Seymour St., Syracuse, N. Y.
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- Hoover Steel Ball Co., Ann Arbor, Mich.
- Shafer Bearing Corp'n, 6501-99 W. Grand Ave., Chicago, Ill.

### BEARINGS (Self-Aligning, Thrust)

- \*Gwilliam Co., 360 Furman St., Brooklyn, N. Y. ....104, 105
- \*Kingsbury Machine Works (Inc.), 4326 Tackawanna St., Philadelphia, Pa. ....132
- \*Norma-Hoffmann Bearings Corp'n, Stamford, Conn. ....154
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- Rollway Bearing Co. (Inc.), 541 Seymour St., Syracuse, N. Y.

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### BEARINGS (Thrust, Ball)

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- Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J.
- Manheim Mfg. & Belting Co., Manheim, Pa.
- Robins Conveying Belt Co., 15 Park Row, New York, N. Y.
- Ton-Tex Corp'n, 129-131 W. 22nd St., New York, N. Y.

### BELTING (Elevator)

- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio .....36
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- Robins Conveying Belt Co., 15 Park Row, New York, N. Y.

### BELTING (Endless)

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- Ton-Tex Corp'n, 129-131 W. 22nd St., New York, N. Y.

### BELTING (Fabric)

- \*Gates Rubber Co., 999 S. Broadway, Denver, Colo. ....96
- Brown, Arthur S. Mfg. Co., Tilton, N. H.

### BELTING (Leather)

- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Chicago Belting Co., 116 N. Green St., Chicago, Ill.
- Chicago Rawhide Mfg. Co., 1267-1301 Elston Ave., Chicago, Ill.
- Schieren, Chas. A. Co., 30 Ferry St., New York, N. Y.

### BELTING (Round, Solid)

- \*Gates Rubber Co., 999 S. Broadway, Denver, Colo. ....96
- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Brown, Arthur S. Mfg. Co., Tilton, N. H.
- Chicago Belting Co., 116 N. Green St., Chicago, Ill.

### BELTING (Round, Twist)

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- Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc., Passaic, N. J.

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- Manheim Mfg. & Belting Co., Manheim, Pa.
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- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
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- \*American Blower Corp'n. ("Sirocco"), 6000 Russell St., Detroit, Mich. 9
- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
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Pennsylvania Furnace & Iron Co., Warren, Pa.  
Preferred Utilities Co. (Inc.), 33 W. 60th St., New York, N. Y.  
St. Louis Blow Pipe & Heater Co., 1948 N. Ninth St., St. Louis, Mo.

## CONDITIONING SYSTEMS (Air, Railroad Passenger Cars)

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- \*General Electric Co. ("Greenfield Duct") ("Sprigduct"), 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
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## CONTACTS (Electrical, Silver)

- Wilson, H. A., Co., 97 Chestnut St., Newark, N. J.

## CONTACTS (Electrical, Tungsten)

- Wilson, H. A., Co., 97 Chestnut St., Newark, N. J.

## CONTAINERS (R. R. Car or Motor Truck, Air Unloading)

- \*Kennedy-Van Sam Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. 130

## CONTROL SYSTEMS (Boiler Feedwater)

(See Regulators, Feedwater)

## CONTROL SYSTEMS (Combustion)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27
- \*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41
- \*Carrick Engrg. Co., 835 E. 8th St., Michigan City, Ind. 50
- \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51
- \*Smoot Engineering Corp'n, 2242 Diversey Parkway, Chicago, Ill. 172, 173

Brooke Engineering Co. (Inc.), 175 W. Hunt-  
ington St., Philadelphia, Pa.

Leak & Northrup Co., 4901 Stenton Ave.,  
Philadelphia, Pa.

Minneapolis-Honeywell Regulator Co., 2747-  
53 Fourth Ave. S., Minneapolis, Minn.

Weeks Merit System (Inc.), 228 Aborn St.,  
Providence, R. I.

## CONTROL SYSTEMS (Draft)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27
- \*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41
- \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51
- \*Smoot Engineering Corp'n, 2242 Diversey Parkway, Chicago, Ill. 172, 173

Minneapolis-Honeywell Regulator Co., 2747-  
53 Fourth Ave. S., Minneapolis, Minn.

Weeks Merit System (Inc.), 228 Aborn St.,  
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## CONTROL SYSTEMS (Electric Crane)

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- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

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- \*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41

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Waterbury Tool Co., Waterbury, Conn.

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- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27
- \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51

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- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- \*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. 214

## CONTROLLERS (Elevator)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

## CONTROLLERS (Feedwater)

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## CONTROLLERS (Filter Rate)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27

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- \*Automatic Primer Co., 28 N. Clark St., Chicago, Ill. 223
- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27
- \*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41
- \*Bristol Co., Waterbury, Conn. 42
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
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*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....	36
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Robins Conveying Belt Co., 15 Park Row, New York, N. Y. ....	
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*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....	4, 5, 6, 7
*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....	36
*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. ....	52
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*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....	36
*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. ....	52
*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....	120, 121
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*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....	120, 121
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Logan Co., 530 N. Buchanan St., Louisville, Ky. ....	
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## CONVEYORS (Scraper, Flight, Push-Bar or Drag)

*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....	36
*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. ....	52
*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....	120, 121
*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....	130
*Link-Belt Co., 300 W. Pershing Road, Chicago, Ill. ....	136
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*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. ....	52
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*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....	36
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- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Condenser Service & Engrg. Co., 310 12th St., Hoboken, N. J. 62, 63
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
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## COOLERS (Beer, Baudelot, etc.)

- Harris, Arthur & Co., 210-218 N. Curtis St., Chicago, Ill.

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- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
- \*Bigelow Co., 76 River St., New Haven, Conn. 34
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- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2

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## COOLERS (Oil)

- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Badger, E. B., & Sons Co., 75 Pitts St., Boston, Mass. 21
- \*Condenser Service & Engrg. Co., 310 12th St., Hoboken, N. J. 62, 63
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- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
- Buckeye Blower Co., Columbus, Ohio

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- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*American Blower Corp'n ("Decalorator"), 6000 Russell St., Detroit, Mich. 9
- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
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- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
- \*Cooling Tower Co. (Inc.), 15 John St., New York, N. Y. 59
- \*Schubert-Christy Corp'n, Georgia St., Frisco R. R. & New Hampshire Ave., Afton, Mo. 184
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- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

## COOLING SYSTEMS (Public Buildings)

- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

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- \*Badger, E. B., & Sons Co., 75 Pitts St., Boston, Mass. 21
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- Mills Rolls

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- Carding Machines Opening Machines
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- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. 142
- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

## COUNTERSHAFTS (Friction Clutch)

- \*McMahon & Co., Water St., cor. Ledge St., Worcester, Mass. 140

## COUNTING & PACKING MACHINES

- (Coin)
- Pneumatic Scale Corp'n, Ltd., 34 Newport Ave., North Quincy, Mass.

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- Boston Gear Works (Inc.), N. Quincy, Mass.

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- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. 142

- \*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio 161

- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Nicholson, W. H., & Co., 134 Oregon St., Wilkes-Barre, Pa.

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- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

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## COUPLINGS (Hose)

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- \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69
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- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. 130
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- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Falk Corp'n, Milwaukee, Wis. 88
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- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
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- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180

- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Bond Foundry & Machine Co., Manheim, Lancaster County, Pa.

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- \*McMahon & Co., Water St., Cor. Ledge St., Worcester, Mass. 140
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. 142
- Brown Engineering Co., 121 N. Third St., Reading, Pa.
- Conway Clutch Co., 1544 Queen City Ave., Cincinnati, Ohio
- St. Regis Paper Co., Oswego, N. Y.

## COUPLINGS (Shaft, Flexible)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Bartlett Hayward Co. ("Fast"), Scott & McHenry Sts., Baltimore, Md. 35
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
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 \*Kirk & Blum Mfg. Co., 2871 Spring Grove  
 Ave., Cincinnati, Ohio .... 133  
 \*Proctor & Schwartz (Inc.), 7th St. & Tabor  
 Road, Philadelphia, Pa. .... 169  
 Sturtevant, B. F., Co., Hyde Park, Boston,  
 Mass. .... 196

**DRIERS (Lumber)**

(See Kilns, Dry)

**DRIERS (Meal)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
 ..... 4, 5, 6, 7  
 \*Bartlett & Snow Co., C. O., 6450 Harvard  
 Ave., Cleveland, Ohio .... 36  
 \*Hardinge Co. (Inc.), York, Pa. .... 107  
 \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2  
 Park Ave., New York, N. Y. .... 130

**DRIERS (Ore)**

(See Furnaces, Roasting also Driers, Direct  
 Heat)

**DRIERS (Phosphate)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
 ..... 4, 5, 6, 7  
 \*Bartlett & Snow Co., C. O., 6450 Harvard  
 Ave., Cleveland, Ohio .... 36  
 \*Hardinge Co. (Inc.), York, Pa. .... 107  
 \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2  
 Park Ave., New York, N. Y. .... 130

**DRIERS (Porcelain Glaze)**

\*Buffalo Forge Co., 495 Broadway, Buffalo,  
 N. Y. .... 44  
 \*Kirk & Blum Mfg. Co., 2871 Spring Grove  
 Ave., Cincinnati, Ohio .... 133

**DRIERS (Pulp)**

\*Bartlett & Snow Co., C. O., 6450 Harvard  
 Ave., Cleveland, Ohio .... 36  
 \*Buffalo Forge Co., 495 Broadway, Buffalo,  
 N. Y. .... 44  
 \*Hardinge Co. (Inc.), York, Pa. .... 107  
 \*Proctor & Schwartz (Inc.), 7th St. & Tabor  
 Road, Philadelphia, Pa. .... 169  
 Freas Thermo-Electric Co., 1206 S. Grove  
 St., Irvington, N. J.

**DRIERS (Raw Stock)**

\*Bartlett & Snow Co., C. O., 6450 Harvard  
 Ave., Cleveland, Ohio .... 36  
 \*Kirk & Blum Mfg. Co., 2871 Spring Grove  
 Ave., Cincinnati, Ohio .... 133  
 \*Proctor & Schwartz (Inc.), 7th St. & Tabor  
 Road, Philadelphia, Pa. .... 169

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Driers (Cloth) Driers (Yarns)  
 Driers (Textile)

**DRIERS (Room Type)**

\*Kirk & Blum Mfg. Co., 2871 Spring Grove  
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**DRIERS (Rotary)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis.  
 ..... 4, 5, 6, 7  
 \*Babcock & Wilcox Co. ("Fuller"), 85 Lib-  
 erty St., New York, N. Y. .... 22, 23, 24, 25  
 \*Bartlett & Snow Co., C. O., 6450 Harvard  
 Ave., Cleveland, Ohio .... 36  
 \*Bigelow Co., 76 River St., New Haven,  
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 \*Buffalo Forge Co., 495 Broadway, Buffalo,  
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 \*Hardinge Co. (Inc.), York, Pa. .... 107  
 \*Kollogg, M. W., Co. ("Masterweld"), 225  
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 \*Kennedy-Van Saun Mfg. & Eng. Corp'n,  
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 \*Murray Iron Works Co., Burlington, Iowa  
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 \*Whiting Corp'n, 15627 Lathrop Ave., Har-  
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**DRIERS (Rubber)**

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 Ave., Cincinnati, Ohio .... 133  
 Freas Thermo-Electric Co., 1206 S. Grove  
 St., Irvington, N. J.



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- \*Babcock & Wilcox Co. ("Fuller"), 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio. 36
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Hardinge Co. (Inc.), York, Pa. 107
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. 130
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## DRIERS (Shell, Steam Jacketed)

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- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
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- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio. 36

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- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio. 133
- \*Proctor & Schwartz (Inc.), 7th St. & Tabor Road, Philadelphia, Pa. 169
- \*Sturtevant, B. F., Co., Hyde Park, Boston, Mass. 196
- Freas Thermo-Electric Co., 1206 S. Grove St., Irvington, N. J.
- Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa.

## DRIERS (Tobacco)

- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio. 36
- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
- \*Hardinge Co. (Inc.), York, Pa. 107
- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio. 133
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- Freas Thermo-Electric Co., 1206 S. Grove St., Irvington, N. J.

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## DRILLING (Core, Contract)

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## DRILLING MACHINES (Electric, Portable)

- United States Electrical Tool Co., Cincinnati, Ohio.

## DRILLING MACHINES (Heavy Duty)

- \*Barnes Drill Co., 819-837 Chestnut St., Rockford, Ill. 31

## DRILLING MACHINES (High Speed)

- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
- Providence Engineering Works (Inc.), 521 S. Main St., Providence, R. I.

## DRILLING MACHINES (Multiple Spindle)

- \*Barnes Drill Co., 819-837 Chestnut St., Rockford, Ill. 31
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- Providence Engineering Works (Inc.), 521 S. Main St., Providence, R. I.

## DRILLING MACHINES (Pneumatic, Portable)

- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
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- Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio.

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- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
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- \*Barnes Drill Co., 819-837 Chestnut St., Rockford, Ill. 31
- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44

## DRILLING, RIGS, WELL (Portable)

- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197
- Bucyrus-Erie Co., S. Milwaukee, Wis.
- Parkersburg Rig & Reel Co., Parkersburg, W. Va.

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- \*Barnes Drill Co., 819-837 Chestnut St., Rockford, Ill. 31
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- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio. 120, 121
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## DRILLS (Coal, Pneumatic)

- \*Ingersoll-Rand Co. ("Jackhammer"), 11 Broadway, New York, N. Y. 115
- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197

## DRILLS (Core)

- \*Ingersoll-Rand Co. ("Calyx"), 11 Broadway, New York, N. Y. 115
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- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197

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- \*Ingersoll-Rand Co. ("Jackhammer"), 11 Broadway, New York, N. Y. 115
- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

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- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197

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- \*Fairbanks, Morse & Co. ("Flex-Mor"), 900 S. Wabash Ave., Chicago, Ill. 85
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- \*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. 165
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
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- Seamless Steel Equipment Corp'n, 39 Broadway, New York, N. Y.

## DRUMS (Boiler, Welded)

- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
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- \*Hayward Co., 40-46 Dey St., New York, N. Y. 112

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## DRUMS (Steel, Shipping)

- \*Pressed Steel Tank Co. ("Hackuey"), 6625 Greenfield Ave., Milwaukee, Wis. 168

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- Coils
- Driers
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- Drying Systems
- Exhaust Systems
- Fans
- Heaters
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- \*Proctor & Schwartz (Inc.), 7th St. & Tabor Road, Philadelphia, Pa. 169

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- Bay State Elevator Co. (Inc.), Springfield, Mass.
- Gurney Elevator Co. (Inc.), 109 W. 64th St., New York, N. Y.
- Sedgwick Machine Works, 150 W. 15th St., New York, N. Y.

## DUMBWAITERS (Hydraulic)

- Bay State Elevator Co. (Inc.), Springfield, Mass.

## DUMPERS (Car, Cupola Charging)

- \*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. 216, 217



<p><b>DUMPERS (Car, Railroad)</b> Alliance Machine Co., Alliance, Ohio.</p> <p><b>DUST ARRESTERS</b> (See Collectors, Filters, etc.)</p> <p><b>DUST COLLECTING SYSTEMS</b> (See Collecting Systems)</p> <p><b>DUSTING MACHINES (Textile)</b> *Proctor &amp; Schwartz (Inc.), 7th St. &amp; Tabor Road, Philadelphia, Pa. 169</p> <p><b>DYEING MACHINES (Textile)</b> *Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114 Franklin Machine Co., 44 Cross St., Providence, R. I.</p> <p><b>DYNAMOMETERS</b> *General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101 *Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106 *Murray Iron Works Co. ("Murray"), Burlington, Iowa 145 Chatillon, John, &amp; Sons, 85 Cliff St., New York, N. 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Co., 901-99 N. 4th St., Columbus, Ohio. 120, 121 Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Belt Driven)</b> *Kennedy-Van Sann Mfg. &amp; Eng. Corp'n, 2 Park Ave., New York, N. Y. 130 Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Bucket)</b> (See Conveyors, Bucket)</p> <p><b>ELEVATORS (Electric)</b> Bay State Elevator Co. (Inc.), Springfield, Mass. Gurney Elevator Co. (Inc.), 109 W. 64th St., New York, N. Y. Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Gravel, Hydraulic)</b> (See Pumps, Jet)</p> <p><b>ELEVATORS (Hand Power)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Hydraulic)</b> Bay State Elevator Co. (Inc.), Springfield, Mass. Denison Engrg. Co., Delaware, Ohio. Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Hydraulic Plunger)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. 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Co., Erie, Pa. 118 Malleable Iron Fittings Co., Branford, Conn.</p>	<p><b>ELECTRIC FURNACES, GENERATORS, HOISTS, TRUCKS, WELDING, ETC.</b> (See Furnaces, Generators, Hoists, Trucks, Welding, etc., Electric)</p> <p><b>ELECTRIC MACHINERY: See</b> Charging Outfits      Motor Starters Condensers            Motors Controllers            Rectifiers Converters            Rheostats Generators            Switchboards Instruments            Switches Meters                  Transformers, etc. Motor Generators      Turbo Generators</p> <p><b>ELECTRIC MEASURING INSTRUMENTS</b> (See Instruments, Electric Measuring, Ammeters, Voltmeters, Wattmeters, etc.)</p> <p><b>ELECTRIC SPECIALTIES</b> (See Specific Item Desired)</p> <p><b>ELECTRIC SUPPLIES</b> (See Specific Item Desired)</p> <p><b>ELECTRIC TESTING APPARATUS: See</b> Ammeters              Rheostats Megohmmeters          Voltmeters Potentiometers          Wattmeters</p> <p><b>ELECTRODES</b> *General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101</p> <p><b>ELECTRODES (Arc Welding)</b> *General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101 *Incoln Electric Co. ("Stable-Arc") ("Pleatweld") ("Anode") ("Lightweld") ("Kathode") ("Stahweld A") ("Aluminweld") ("Hardweld") ("Maganweld") ("Ferroweld") ("Shield-Arc 85") ("Wearweld"), 13034 Coit Road, Cleveland, Ohio. 155 *Reichling's, John A. Sons Co., Trenton, N. J. 179</p> <p><b>ELEVATING AND CONVEYING MACHINERY: See</b> Buckets                  Feeders Chutes                   Hoists Conveyors                Tying Machines Cranes                   Trucks, Elevating Elevators</p> <p><b>ELEVATING TRUCKS</b> (See Trucks, Elevating)</p> <p><b>ELEVATOR CABLE</b> (See Cable)</p> <p><b>ELEVATORS</b> (See below and also Conveyors, Tying Machines, etc.)</p> <p><b>ELEVATORS (Automatic)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Automobile)</b> *Jeffrey Mfg. Co., 901-99 N. 4th St., Columbus, Ohio. 120, 121 Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Belt Driven)</b> *Kennedy-Van Sann Mfg. &amp; Eng. Corp'n, 2 Park Ave., New York, N. Y. 130 Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Bucket)</b> (See Conveyors, Bucket)</p> <p><b>ELEVATORS (Electric)</b> Bay State Elevator Co. (Inc.), Springfield, Mass. Gurney Elevator Co. (Inc.), 109 W. 64th St., New York, N. Y. Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Gravel, Hydraulic)</b> (See Pumps, Jet)</p> <p><b>ELEVATORS (Hand Power)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Hydraulic)</b> Bay State Elevator Co. (Inc.), Springfield, Mass. Denison Engrg. Co., Delaware, Ohio. Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Hydraulic Plunger)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p>	<p><b>ELEVATORS (Inclined)</b> (See Conveyors, Haulers, and Railways)</p> <p><b>ELEVATORS (Lumber Kilm Car, Hydraulic)</b> *Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84</p> <p><b>ELEVATORS (Pneumatic)</b> (See Conveying Systems)</p> <p><b>ELEVATORS (Portable)</b> (See Tying Machines, Loaders, etc.)</p> <p><b>ELEVATORS (Sidewalk)</b> *Barrett-Cravens Co., 3274 W. 30th St., Chicago, Ill. 34 *Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. 52 Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Telescopic)</b> (See Tying Machines)</p> <p><b>ELEVATORS (Traction)</b> Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.</p> <p><b>ELEVATORS (Tray)</b> (See Conveyors, Tray)</p> <p><b>ELIMINATORS (Air and Erosion, Condenser)</b> *Condenser Service &amp; Engrg. Co. (Inc.), 310-12th St., Hoboken, N. J. 62, 63</p> <p><b>ELIMINATORS (Air)</b> (See Valves, Relief, Air, Gas, etc.)</p> <p><b>EMERY CLOTH</b> (See Sheets, Abrasive, Cloth; Discs, Cloth, Abrasive)</p> <p><b>EMULSIFIERS</b> (See Mixers and Mills)</p> <p><b>ENAMELS (Phenolic Composition)</b> *Bakelite Corp'n ("Bakelite"), 247 Park Ave., New York, N. Y. 30</p> <p><b>ENGINE ROOM SUPPLIES</b> (See Specific Item Desired)</p> <p><b>ENGINES (Alcohol)</b> Hercules Motors Corp'n, Canton, Ohio.</p> <p><b>ENGINES (Blowing)</b> *Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7 *DeLaval Steam Turbine Co., Trenton, N. J. 73</p> <p><b>ENGINES (Compressed Air)</b> *Detroit Hoist &amp; Machine Co., 8201 Morrow St., Detroit, Mich. 76</p> <p><b>ENGINES (Distillate)</b> *Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7 *Fairbanks, Morse &amp; Co., 900 S. Wabash Ave., Chicago, Ill. 85</p> <p><b>ENGINES (Dredging)</b> *Morris Machine Works, Baldwinville, N. Y. 141 *Murray Iron Works Co. ("Murray"), Burlington, Iowa. 145</p> <p><b>ENGINES (Gas)</b> *Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7 *Fairbanks, Morse &amp; Co., 900 S. Wabash Ave., Chicago, Ill. 85 *Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106 *Ingersoll-Rand Co. ("Ingersoll-Rand") ("Rathbun"), 11 Broadway, New York, N. Y. 115 *Worthington Pump &amp; Machinery Corp'n, Harrison, N. J. 219 Buffalo Gasoline Motor Co., Buffalo, N. Y. National Transit Pump &amp; Machine Co., 19 N. Petroleum St., Oil City, Pa. Rathbun-Jones Engineering Co., Spencer St., Toledo, Ohio. Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.</p> <p><b>ENGINES (Gas, Natural)</b> *Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7 *Fairbanks, Morse &amp; Co., 900 S. Wabash Ave., Chicago, Ill. 85 *Ingersoll-Rand Co. ("Ingersoll-Rand") ("Rathbun"), 11 Broadway, New York, N. Y. 115 *Worthington Pump &amp; Machinery Corp'n, Harrison, N. J. 219 Cooper-Bessmer Corp'n, Mt. Vernon, Ohio. Hercules Motors Corp'n, Canton, Ohio.</p>



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## ENGINES (Gasoline)

(See also Power Units)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- Buffalo Gasolene Motor Co., Buffalo, N. Y.
- Hercules Motors Corp'n, Canton, Ohio.

## ENGINES (Haulage)

- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio 36

## ENGINES (Hoisting)

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- Ellieott Machine Corp'n, 1611 Bush St., Baltimore, Md.

## ENGINES (Jordan)

(See Refining Machines, Paper Pulp)

## ENGINES (Kerosene)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Fairbanks, Morse Co., 900 S. Wabash Ave., Chicago, Ill. 85
- Hercules Motors Corp'n, Canton, Ohio.

## ENGINES (Marine)

- \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*McIntosh & Seymour Corp'n, Auburn, N. Y. 138
- \*Morris Machine Works, Baldwinsville, N. Y. 141
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- Buffalo Gasolene Motor Co., Buffalo, N. Y.
- Cooper-Bessemer Corp'n, Mt. Vernon, Ohio.
- Ellieott Machine Corp'n, 1611 Bush St., Baltimore, Md.

## ENGINES (Marine, Oil)

- \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*McIntosh & Seymour Corp'n, Auburn, N. Y. 138
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Bolinders Co. (Inc.), 33 Rector St., New York, N. Y.
- Cooper-Bessemer Corp'n, Mt. Vernon, Ohio.

## ENGINES (Marine, Oil, Diesel)

- \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*McIntosh & Seymour Corp'n, Auburn, N. Y. 138
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## ENGINES (Marine, Steam)

- \*Morris Machine Works, Baldwinsville, N. Y. 141
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- \*Skinner Engine Co., Erie, Pa. 190
- Ellieott Machine Corp'n, 1611 Bush St., Baltimore, Md.

## ENGINES (Oil)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*McIntosh & Seymour Corp'n, Auburn, N. Y. 138
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Cooper-Bessemer Corp'n, Mt. Vernon, Ohio.
- Rathbun-Jones Engineering Co., Spencer St., Toledo, Ohio.
- Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

## ENGINES (Oil, Diesel)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47

- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*McIntosh & Seymour Corp'n, Auburn, N. Y. 138
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Bolinders Co. (Inc.), 33 Rector St., New York, N. Y.
- Hercules Motors Corp'n, Canton, Ohio.
- Providence Engineering Works (Inc.), 521 S. Main St., Providence, R. I.
- Reid Joseph, Gas Engine Co., Box 177, Oil City, Pa.
- Venn-Severin Machine Co., 1317 W. North Ave., Chicago, Ill.

## ENGINES (Pumping, Water Works)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*Morris Machine Works, Baldwinsville, N. Y. 141
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Buffalo Gasolene Motor Co., Buffalo, N. Y.

## ENGINES (Pumping, Well)

(See Pumping Powers)

## ENGINES (Reversing, Mill)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7

## ENGINES (Steam)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Morris Machine Works, Baldwinsville, N. Y. 141
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Skinner Engine Co., Erie, Pa. 190
- \*Troy Engine & Machine Co. ("Troy"), ("Engberg"), Troy, Pa. 207
- Ames Iron Works, Oswego, N. Y.
- Ellieott Co., Pittsburgh, Pa.
- Erie Rail Engine Co., First & Talbot Sts., Braddock, Pa.
- Erie City Iron Works, Erie, Pa.
- Providence Engineering Works (Inc.), 521 S. Main St., Providence, R. I.

## ENGINES (Steam, Corliss)

- \*Allis-Chalmers Mfg. Co. ("Allis"), ("Reynolds"), ("Reliance"), Milwaukee, Wis. 4, 5, 6, 7
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- Franklin Machine Co., 44 Cross St., Providence, R. I.

## ENGINES (Steam, High Speed)

- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Skinner Engine Co., Erie, Pa. 190
- \*Troy Engine & Machine Co. ("Troy"), ("Engberg"), Troy, Pa. 207

## ENGINES (Steam, Horizontal Fully Enclosed Self-Oiling)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Skinner Engine Co., Erie, Pa. 190
- \*Troy Engine & Machine Co. ("Troy"), Troy, Pa. 207

## ENGINES (Steam, Poppet Valve)

- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Skinner Engine Co., Erie, Pa. 190

## ENGINES (Steam, Throttling)

- \*American Blower Corp'n ("A B C"), 6000 Russell St., Detroit, Mich. 9
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Skinner Engine Co., Erie, Pa. 190
- \*Troy Engine & Machine Co. ("Troy"), ("Engberg"), Troy, Pa. 207

## ENGINES (Steam, Uniflow)

- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145

- \*Skinner Engine Co. ("Universal Uniflow"), Erie, Pa. 190
- Ames Iron Works, Oswego, N. Y.

## ENGINES (Steam, Variable Speed)

- \*Skinner Engine Co., Erie, Pa. 190

## ENGINES (Steam, Vertical, Fully Enclosed, Self-Oiling)

- \*American Blower Corp'n ("A B C"), 6000 Russell St., Detroit, Mich. 9
- \*Morris Machine Works, Baldwinsville, N. Y. 141
- \*Murray Iron Works Company ("Murray"), Burlington, Iowa 145
- \*Skinner Engine Co., Erie, Pa. 190
- \*Troy Engine & Machine Co. ("Troy"), ("Engberg"), Troy, Pa. 207
- Clarage Fan Co., Kalamazoo, Mich.

## ENGINES (Steering)

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13

## ENGINE STOPS

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## ENGINES (Well Drilling, Internal Combustion)

- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- Buffalo Gasolene Motor Co., Buffalo, N. Y.
- Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

## ENGRAVING MACHINES

- Preis, H. P., Engraving Machine Co., 155-157 Summit St., Newark, N. J.

## ENGRAVING WORK (Metal)

(See Dies)

## EQUALIZING SETS

(See Motor Generators)

## ETHYLENE GAS

(See Gas)

## EVAPORATORS

- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Badger, E. B., & Sons Co., 75 Pitts St., Boston, Mass. 21
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Kellogg, M. W., Co., 225 Broadway, New York, N. Y. 127
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185

- Chemical Equipment Co. (Inc.), Montpelier, Ind.
- Swenson Evaporator Co., Harvey, Ill.

## EVAPORATORS (Crystallizing)

- Swenson Evaporator Co., Harvey, Ill.

## EVAPORATORS (High Density)

- Swenson Evaporator Co., Harvey, Ill.

## EVAPORATORS (Milk)

- Harris, Arthur, & Co., 210-218 N. Curtis St., Chicago, Ill.

## EVAPORATORS (Multiple)

- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2

- Leader Industries (Inc.), Decatur, Ill.
- Swenson Evaporator Co., Harvey, Ill.
- U. S. Pipe & Foundry Co., Burlington, N. J.

## EVAPORATORS (Salt)

- Swenson Evaporator Co., Harvey, Ill.

## EVAPORATORS (Sugar)

- Swenson Evaporator Co., Harvey, Ill.
- U. S. Pipe & Foundry Co., Burlington, N. J.

## EVAPORATORS (Sulphate Recovery)

- Swenson Evaporator Co., Harvey, Ill.

## EXCAVATING MACHINERY: See

- Buckets
- Cableways
- Cranes
- Derricks
- Ditchers
- Draglines
- Hoists
- Pile Drivers
- Shovels
- Trenching Machines
- Winches

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## FORGINGS (Bronze)

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- \*American Manganese Bronze Co. ("Hy-tens"), Holmesburg, Philadelphia, Pa. 14
- \*Scovill Mfg. Co., Waterbury, Conn. 186

## FORGINGS (Chrome Steel)

- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.

## FORGINGS (Copper)

- \*American Brass Co. ("Anaconda"), Waterbury, Conn. 10
- \*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa. 14
- \*Scovill Mfg. Co., Waterbury, Conn. 186
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.

## FORGINGS (Crank)

- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- Heppenstall Co., 4620 Hatfield St., Pittsburgh, Pa.

## FORGINGS (Drop)

- \*Bethlehem Steel Co. (Inc.), Bethlehem, Pa. 39
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.

## FORGINGS (Hammered)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Bethlehem Steel Co. (Inc.), Bethlehem, Pa. 39
- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.

## FORGINGS (Hand)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153

## FORGINGS (Heavy)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Bethlehem Steel Co. (Inc.), Bethlehem, Pa. 39
- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- Heppenstall Co., 4620 Hatfield St., Pittsburgh, Pa.
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- Prosser, Thomas, & Son, 15 Gold St., New York, N. Y.

## FORGINGS (Hollow Steel)

- Heppenstall Co., 4620 Hatfield St., Pittsburgh, Pa.
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- Seamless Steel Equipment Corp'n, 39 Broadway, New York, N. Y.

## FORGINGS (Hydraulic)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153

## FORGINGS (Iron)

- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52

## FORGINGS (Manganese Bronze)

- \*American Brass Co. ("Everdur"), Waterbury, Conn. 10
- \*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa. 14

## FORGINGS (Nickel)

- \*International Nickel Co. (Inc.), 67 Wall St., New York, N. Y. 116

## FORGINGS (Nickel-Chromium)

- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.

## FORGINGS (Nickel-Copper)

- \*International Nickel Co. (Inc.), ("Monel Metal"), 67 Wall St., New York, N. Y. 116
- Clapp, E. D., Mfg. Co., Auburn, N. Y.

## FORGINGS (Nickel-Silver)

- \*American Brass Co. ("Anaconda"), Waterbury, Conn. 10
- \*Scovill Mfg. Co., Waterbury, Conn. 186

## FORGINGS (Steel)

- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- \*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.
- Heppenstall Co., 4620 Hatfield St., Pittsburgh, Pa.
- National Forge & Ordnance Co., Irvine, Warren Co., Pa.
- Vulcan Steam Forging Co., 247 Rano St., Buffalo, N. Y.

## FORGINGS (Steel Alloy)

- National Forge & Ordnance Co., Irvine, Warren Co., Pa.

## FORGINGS (Tool Steel)

- \*Johnston & Jennings Co., 879 Addison Road, Cleveland, Ohio 119
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Endicott Forging & Mfg. Co. (Inc.), Endicott, N. Y.
- Heppenstall Co., 4620 Hatfield St., Pittsburgh, Pa.

## FORMING, FILING & CLOSING MACHINES (Carton)

- Pneumatic Scale Corp'n, Ltd., 34 Newport Ave., North Quincy, Ill.

## FORMING MACHINES

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## FORMING MACHINES (Carton, Automatic)

- Pneumatic Scale Corp'n, Ltd., 34 Newport Ave., North Quincy, Mass.

## FORMING MACHINES (Hydraulic)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## FORMS, STEEL (Concrete Construction)

- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133
- Koppel Industrial Car & Equipment Co., Koppel, Pa.

## FOUNDATIONS (Machinery, Brick or Concrete)

- \*Page, Frederick, Contracting Co., 45 E. 17th St., New York, N. Y. 158, 159

## FOUNDATIONS (Machinery, Felt)

- \*John-Manville, 22 E. 40th St., New York, N. Y. 124, 125, 126

## FOUNDRY EQUIPMENT: See

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- Conveyors
- Crucibles
- Cupolas
- Cutting Machines
- Furnaces
- Hoists
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- Molding Machines
- Ovens
- Racks
- Riddles
- Sand Blast Apparatus
- Screens
- Tongs
- Towers, Cooling
- Trucks, Oven

## FOUNDRY FACING

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## FOUNTAINS (Drinking)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

## FRACTIONATING COLUMNS

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## FRAMES & COVERS (Manhole, Coal Hole, Meter, etc.)

- \*American District Steam Co., N. Tonnawanda, N. Y. 12
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Murray, A. B., Co. (Inc.), 153 Wolcott St., Brooklyn, N. Y. 145

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- Forsberg Mfg. Co., Bridgeport, Conn.

## FRAMES (Hack Saw)

- Forsberg Mfg. Co., Bridgeport, Conn.

## FREQUENCY CHANGERS (Electric)

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## FRICTION CLUTCHES

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## FRICTIONS (Paper and Iron)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. 142

## FRONTS (Boiler)

- \*Bigelow Co., 76 River St., New Haven, Conn. 34
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Grainger Machinery Corp'n, 13 Park Row, New York, N. Y. 106

## FUEL ECONOMIZERS

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- Gas Analyzers
- Gas Oxygen
- Hydrometers
- Mills
- Ovens
- Scales
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## FULLING MACHINES (Textile)

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## FURNACE BOTTOMS

(See Bottoms)

## FURNACES ROOFS (Metallurgical)

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## FURNACES (Annealing)

- \*American Gas Furnace Co., Elizabeth, N. J. 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. 148
- \*Whiting Corp'n ("Quick-Anneal"), 15627 Lathrop Ave., Harvey, Ill. 216, 217

## Ajax Electrothermic Corp'n, Ajax Park, Trenton, N. J.

- Electric Furnace Co., Salem, Ohio.
- Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa.
- Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

## FURNACES (Annealing, Car Type)

(See Furnaces, Car Bottom)

## FURNACES (Babbitt)

(See Furnaces, Crucible, Melting, Pot, etc.)

## FURNACES (Billet Heating)

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20
- Electric Furnace Co., Salem, Ohio.



**FURNACES (Blast)**

(See also Forges)

- \*Chicago Bridge & Iron Works, 2131 Old Colony Bldg., Chicago, Ill. .... 54

**FURNACES (Boiler)**

- \*American Arch Co. (Inc.), 64 E. 42nd St., New York, N. Y. .... 8
- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13
- \*Babcock & Wilcox Co. ("Bailey"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Bernitz Furnace Appliance Co. ("Long Life") ("Clinker-Proof"), 89 Broad St., Boston, Mass. .... 38
- \*Bigelow-Liptak Corp'n, 2842 W. Grand Blvd., Detroit, Mich. .... 40
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. .... 60, 61
- \*Detroit Stoker Co. General Motors Bldg., Detroit, Mich. .... 77
- \*DeWolf Furnace Corp'n, 119 E. Main St., Rochester, N. Y. .... 78
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. .... 130
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. .... 148
- \*Riley Stoker Corp'n, Worcester, Mass. .... 174, 175

**FURNACES (Boiler, Downdraft)**

- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. .... 60, 61

**FURNACES (Boiler, Smokeless)**

- \*Bernitz Furnace Appliance Co. ("Long Life") ("Clinker-Proof"), 89 Broad St., Boston, Mass. .... 38
- \*Detroit Stoker Co. General Motors Bldg., Detroit, Mich. .... 77
- \*Granger Machinery Corp'n ("Hawley"), 13 Park Row, New York, N. Y. .... 106
- \*Riley Stoker Corp'n, Worcester, Mass. .... 174, 175

**FURNACES (Boiler, Waste Burning Bagasse, Wood Trimming, etc.)**

- \*American Arch Co. (Inc.), 64 E. 42nd St., New York, N. Y. .... 8
- \*Bernitz Furnace Appliance Co., 89 Broad St., Boston, Mass. .... 38
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. .... 60, 61
- Burke Stoker & Mfg. Co., 919-27 W. 19th St., Chicago, Ill.
- Superheater & Engineering Co., 39 Cortlandt St., New York, N. Y.

**FURNACES (Boiler, Waste Heat)**

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Bigelow Co., 76 River St., New Haven, Conn. .... 34
- \*Combustion Engineering Co. (Inc.) ("C-E") ("Heine") ("Ladd"), 200 Madison Ave., New York, N. Y. .... 60, 61
- Erie City Iron Works, Erie, Pa.

**FURNACES (Boiler, Water Cooled)**

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13
- \*Babcock & Wilcox Co. ("Bailey"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Bernitz Furnace Appliance Co., 89 Broad St., Boston, Mass. .... 38
- \*Bigelow Co., 76 River St., New Haven, Conn. .... 34
- \*Combustion Engineering Co. (Inc.) ("C-E") ("Walsh-Weidner"), 200 Madison Ave., New York, N. Y. .... 60, 61
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. .... 130
- \*Riley Stoker Corp'n, Worcester, Mass. .... 174, 175
- \*Springfield Boiler Co., Springfield, Ill. .... 192, 193
- Erie City Iron Works, Erie, Pa.

**FURNACES (Brazing)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109
- Electric Furnace Co., Salem, Ohio.

**FURNACES (Car Bottom)**

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- Electric Furnace Co., Salem, Ohio.

**FURNACES (Carburizing, Case Hardening)**

(See Furnaces, Hardening, Pot, etc.)

**FURNACES (Coal Burning)**

Electric Furnace Co., Salem, Ohio.

**FURNACES (Continuous)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. .... 214
- Electric Furnace Co., Salem, Ohio.

**FURNACES (Crucible)**

(See also Furnaces, Pot)

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109

**FURNACES (Dross Reducing)**

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**FURNACES (Electric)**

- \*Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich. .... 71
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. .... 214
- Electric Furnace Co., Salem, Ohio.
- Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

**FURNACES (Electric, Induction)**

- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- Ajax Electrothermic Corp'n, Ajax Park, Trenton, N. J.

**FURNACES (Electric, Vacuum)**

- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- Ajax Electrothermic Corp'n, Ajax Park, Trenton, N. J.

**FURNACES (Enameling)**

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**FURNACES (Forging)**

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- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. .... 197
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. .... 219
- Electric Furnace Co., Salem, Ohio.
- Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa.

**FURNACES (Gas)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Beach-Russ Co., 46 Church St., New York, N. Y. .... 37
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. .... 148
- Hones, Charles A. (Inc.), 122 S. Grand Ave., Baldwin, N. Y.
- Strong, Carlisle & Hammond Co., 1392-1394 W. Third St., Cleveland, Ohio.

**FURNACES (Gas & Oil, Combined)**

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. .... 148

**FURNACES (Hardening)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. .... 219
- Eclipse Fuel Engrg. Co., 701-711 S. Main St., Rockford, Ill.
- Electric Furnace Co., Salem, Ohio.
- Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
- Philadelphia Drying Machinery Co., 3351 Stokley St., Philadelphia, Pa.
- Strong, Carlisle & Hammond Co., 1392-1394 W. Third St., Cleveland, Ohio.

**FURNACES (Heat Treating)**

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**FURNACES (Japanning)**

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**FURNACES (Laboratory)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich. .... 71
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- Ajax Electrothermic Corp'n, Ajax Park, Trenton, N. J.

**FURNACES (Lead)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109
- \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. .... 178

**FURNACES (Melting)**

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. .... 4, 5, 6, 7
- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Detroit Electric Furnace Co., 825 W. Elizabeth St., Detroit, Mich. .... 71
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Granger Machinery Corp'n ("Schwartz"), 13 Park Row, New York, N. Y. .... 106
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109
- \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. .... 178
- \*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. .... 216, 217

- Ajax Electrothermic Corp'n, Ajax Park, Trenton, N. J.
- Eclipse Fuel Engrg. Co., 701-711 S. Main St., Rockford, Ill.
- Hones, Charles A. (Inc.), 122 S. Grand Ave., Baldwin, N. Y.
- Pittsburgh Leetromelt Furnace Corp'n, Ft. of 32nd St., Pittsburgh, Pa.

**FURNACES (Muffle)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20

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**FURNACES (Non-Oxidizing)**

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**FURNACES (Oil)**

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*Beach-Russ Co., 46 Church St., New York, N. Y. .... 37
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. .... 115
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. .... 148
- Strong, Carlisle & Hammond Co., 1392-1394 W. Third St., Cleveland, Ohio.

**FURNACES (Pot)**

- \*American Gas Furnace Co., Elizabeth, N. J. .... 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101
- \*Hanck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. .... 109

**FURNACES (Pulverized Coal)**

- \*American Arch Co. (Inc.), 64 E. 42nd St., New York, N. Y. .... 8
- \*Babcock & Wilcox Co. ("Bailey"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Bernitz Furnace Appliance Co., 89 Broad St., Boston, Mass. .... 38
- \*Combustion Engineering Co. (Inc.) ("C-E") ("Walsh-Weidner"), 200 Madison Ave., New York, N. Y. .... 60, 61
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**FURNACES (Recuperative)**

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- Electric Furnace Co., Salem, Ohio.

**FURNACES (Refining)**

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. .... 4, 5, 6, 7
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20

**FURNACES (Reheating)**

- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. .... 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101

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- \*Allis-Chalmers Mfg. Co. ("MacDougall"), Milwaukee, Wis. .... 4, 5, 6, 7



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- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20

## FURNACES (Smelting, Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

## FURNACES (Soldering Iron)

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## FURNACES (Soldering Iron, Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

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- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- Hones, Charles A. (Inc.), 122 S. Grand Ave., Baldwin, N. Y.

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## FURNACES (Tempering, Oil Bath, Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

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- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

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# G

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- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27
- \*Bristol Co., Waterbury, Conn. 42
- \*Brown Instrument Co. ("Brown"), 4496 Wayne Ave., Philadelphia, Pa. 43
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- \*Bristol Co., Waterbury, Conn. 42
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
- \*Consolidated Ashcroft Hancock Co. (Inc.), ("Ashcroft American"), Bridgeport, Conn. 64, 65
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- \*Bristol Co., Waterbury, Conn. 42
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
- \*Consolidated Ashcroft Hancock Co. (Inc.), Bridgeport, Conn. 64, 65
- \*Crosby Steam Gage & Valve Co., 10 Roland St., Boston, Mass. 70
- \*Loneragan, J. E. Co., 211-217 Race St., Philadelphia, Pa. 137
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## GAGES (Block, Combination)

- Ford Motor Co., Johansson Div., 3674 Schaefer Road, Dearborn, Mich.

## GAGES (Differential Pressure)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
- \*Consolidated Ashcroft Hancock Co. (Inc.), Bridgeport, Conn. 64, 65
- \*Crosby Steam Gage & Valve Co., 10 Roland St., Boston, Mass. 70
- \*Hays Corp'n, 1042 E. 8th St., Michigan City, Ind. 111
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## GAGES (Differential Pressure, Recording)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
- \*Hays Corp'n, 1042 E. 8th St., Michigan City, Ind. 111
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. 172, 173
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## GAGES (Draft)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27
- \*Bristol Co., Waterbury, Conn. 42
- \*Brown Instrument Co. ("Brown"), 4496 Wayne Ave., Philadelphia, Pa. 43
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- \*Ellison Draft Gage Co. ("Ellison"), 214 W. Kinzie St., Chicago, Ill. 83

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- \*Loneragan, J. E. Co., 211-217 Race St., Philadelphia, Pa. 137
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. 172, 173

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- United States Gauge Co., 44 Beaver St., New York, N. Y.

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- Ashton Valve Co., 161 First St., Cambridge, Mass.

## GAGES (Pressure, Homogenizer)

- \*Taylor Instrument Cos., Rochester, N. Y. 202

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- \*Taylor Instrument Cos., Rochester, N. Y. 202
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- Ashton Valve Co., 161 First St., Cambridge, Mass.

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- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27
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- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
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## GAS ANALYZERS & PYROMETERS COMBINED (Recording, O, CO, CO<sub>2</sub>, SO<sub>2</sub>, H, NH<sub>3</sub>, etc.)

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\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Falk Corp'n, Milwaukee, Wis. .... 88

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*Grant Gear Works, Second & B Sts., Boston, Mass. .... 103

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio. .... 120, 121

\*Medart Co., 3504 DeKalb St., St. Louis, Mo. .... 142

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

\*Poole Foundry & Machine Co., Baltimore, Md. .... 166

Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.

Boston Gear Works (Inc.), N. Quincy, Mass.

Palmer-Bee Co., Detroit, Mich.

GEARS (Cloth)

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Die-Cast)

\*Doehler Die Casting Co., Toledo, Ohio. .... 80

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Fibre)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill. .... 90

\*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Heliac)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*DeLaval Steam Turbine Co., Trenton, N. J. .... 73

## GEARS (Bevel, Spiral)

\*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill. .... 90

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Boston Gear Works (Inc.), N. Quincy, Mass.

Fairfield Mfg. Co., Lafayette, Ind.

GEARS (Brass)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill. .... 90

\*Grant Gear Works, Second & B Sts., Boston, Mass. .... 103

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Bronze)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13

\*American Manganese Bronze Co., Holmsburg, Philadelphia, Pa. .... 14

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Cleveland Worm & Gear Co., 3263 E. 80th St., Cleveland, Ohio. .... 58

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill. .... 90

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Cast Iron)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Falk Corp'n, Milwaukee, Wis. .... 88

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*Grant Gear Works, Second & B Sts., Boston, Mass. .... 103

\*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill. .... 117

\*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio. .... 120, 121

\*Medart Co., 3504 DeKalb St., St. Louis, Mo. .... 142

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

\*Poole Foundry & Machine Co., Baltimore, Md. .... 166

Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.

Boston Gear Works (Inc.), N. Quincy, Mass.

Palmer-Bee Co., Detroit, Mich.

GEARS (Cloth)

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87

\*General Electric Co., 1 River Road, Schenectady, N. Y. .... 98, 99, 100, 101

\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. .... 165

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Die-Cast)

\*Doehler Die Casting Co., Toledo, Ohio. .... 80

Boston Gear Works (Inc.), N. Quincy, Mass.

GEARS (Fibre)

\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. .... 1

\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

\*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y. .... 87



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*Grant Gear Works, Second & B Sts., Boston, Mass.	103				
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*Moore Steam Turbine Corp'n, Wellsville, N. Y.	144				
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*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.	165				
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*Terry Steam Turbine Co., Terry Square, Hartford, Conn.	204				
*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.	214				
Fairfield Mfg. Co., Lafayette, Ind.					
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Fairfield Mfg. Co., Lafayette, Ind.					
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*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill.	1				
*Doehler Die Casting Co. ("Die-Cast"), Toledo, Ohio	80				
*Farrel-Birmingham Co. (Inc.), 348 Vulcan St., Buffalo, N. Y.	87				
*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill.	90				
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Fairfield Mfg. Co., Lafayette, Ind.					
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*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill.	90				
*Medart Co., 3504 DeKalb St., St. Louis, Mo.	142				
*Poole Foundry & Machine Co., Baltimore, Md.	166				
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<b>GEARS (Phenolic Composition)</b>					
*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill.	1				
*Farrel-Birmingham Company (Inc.), 348 Vulcan St., Buffalo, N. Y.	87				
*Grant Gear Works, Second & B Sts., Boston, Mass.	103				
*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.	117				
*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa.	165				
Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.					
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<b>GEARS (Truck)</b>					
(See Gears, Automobile, Tractor or Truck)					
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*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill.	1				
*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.	14				
*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis.	52				
*Cleveland Worm & Gear Co. ("Cleveland"), 3263 E. 80th St., Cleveland, Ohio	58				
*DeLaval Steam Turbine Co., Trenton, N. J.	73				
*Farrel-Birmingham Company (Inc.), 348 Vulcan St., Buffalo, N. Y.	87				
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*James, D. O., Mfg. Co., 1114 W. Monroe St., Chicago, Ill.	117				
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(See Spreading Machines)

## GLUING MACHINES (Woodworking)

Francis, Chas. E., Co., Rushville, Ind.

## GOVERNORS

(See below and also Controllers, Regulators and Valves)

### GOVERNORS (Air Compressor)

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92  
 \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101  
 \*Jarecki Mfg. Co., Erie, Pa. 118  
 \*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y. 131  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Westinghouse Traction Brake Co., Wilmerding, Pa. 215  
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### GOVERNORS (Desuperheater)

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### GOVERNORS (Elevator)

Pickering Governor Co., Portland, Conn.

### GOVERNORS (Elevator, Hydraulic)

(See Regulators, Pressure)

### GOVERNORS (Engine, Diesel)

Massey Machine Co., 779 Pearl St., Watertown, N. Y.

### GOVERNORS (Engine, Gas)

Massey Machine Co., 779 Pearl St., Watertown, N. Y.  
 Pickering Governor Co., Portland, Conn.

### GOVERNORS (Engine, Oil)

Pickering Governor Co., Portland, Conn.

### GOVERNORS (Engine, Steam)

\*Brassett, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41  
 \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
 \*Jarecki Mfg. Co., Erie, Pa. 118  
 \*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y. 131  
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 Pickering Governor Co., Portland, Conn.

### GOVERNORS (Gas)

\*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
 \*Chaplin-Fulton Mfg. Co. ("Fulton"), 28-40 Penn Ave., Pittsburgh, Pa. 53  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180

### GOVERNORS (Oil Burner)

\*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92

### GOVERNORS (Pump)

\*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio. 26, 27  
 \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
 \*Chaplin-Fulton Mfg. Co. ("Fulton") 28-40 Penn Ave., Pittsburgh, Pa. 53  
 \*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill. 71  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92  
 \*Jarecki Mfg. Co. ("Erie"), Erie, Pa. 118  
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 \*Northern Equipment Co. ("Copes"), 2340 Grove Drive, Erie, Pa. 155  
 \*Ruggles-Klingemann Mfg. Co., Salem, Mass. 181  
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 \*Swartwout Co. ("S-C"), 18537 Euclid Ave., Cleveland, Ohio. 201

### GOVERNORS (Steam Turbine)

\*Brassett, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill. 41  
 \*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
 \*DeLaval Steam Turbine Co., Trenton, N. J. 73  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92

\*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

Massey Machine Co., 779 Pearl St., Watertown, N. Y.  
 Pickering Governor Co., Portland, Conn.

### GOVERNORS (Tractor)

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### GOVERNORS (Vacuum Pump)

(See Regulators, Vacuum)

### GOVERNORS (Water Wheel)

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
 Holyoke Machine Co., Holyoke, Mass.  
 Pickering Governor Co., Portland, Conn.

### GRADING MACHINES (Road)

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7

### GRADUATING MACHINES (Metal)

Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn.

### GRAIN HANDLING MACHINERY

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### GRAINS (Polishing): See

Aluminum Oxide Rotten Stone  
 Emery Rouge  
 Lime Silicon Carbide  
 Pumice Tripoli

### GRANTS (Brewery)

Harris, Arthur, & Co., 210-218 N. Curtis St., Chicago, Ill.

### GRANULATORS

\*Pulverizing Machinery Co., Roselle Park, N. J. 170

### GRANULATORS (Sugar)

\*Beach-Russ Co., 46 Church St., New York, N. Y. 37

### GRAPPLES

\*Hayward Co., 40-46 Dey St., New York, N. Y. 112

### GRATE SHAKERS (Power, Locomotive)

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### GRATES (Dumping)

\*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Granger Machinery Corp'n ("Vulcan"), 13 Park Row, New York, N. Y. 106  
 \*Keeler, E., Co., Williamsport, Pa. 128, 129  
 Hulson Grate Corp'n, 19-21 S. Ninth St., Keokuk, Iowa.  
 Thomas Grate Bar Co., Birmingham, Ala.  
 Washburn & Granger (Inc.), 50 Church St., New York, N. Y.

### GRATES (Kiln)

Thomas Grate Bar Co., Birmingham, Ala.

### GRATES (Rocking)

\*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Granger Machinery Corp'n ("Vulcan"), 13 Park Row, New York, N. Y. 106  
 \*Springfield Boiler Co., Springfield, Ill. 192, 193  
 Thomas Grate Bar Co., Birmingham, Ala.

### GRATES (Shaking)

\*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Granger Machinery Corp'n ("Vulcan"), 13 Park Row, New York, N. Y. 106  
 \*Keeler, E., Co., Williamsport, Pa. 128, 129  
 Erie City Iron Works, Erie, Pa.  
 Hulson Grate Corp'n, 19-21 S. Ninth St., Keokuk, Iowa.  
 Thomas Grate Bar Co., Birmingham, Ala.  
 Washburn & Granger (Inc.), 50 Church St., New York, N. Y.

### GRATES (Shaking, Circular)

Thomas Grate Bar Co., Birmingham, Ala.

### GRATES (Shaking & Dumping)

\*Combustion Engineering Co. (Inc.) ("Grieve"), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
 \*Murray Iron Works Co., Burlington, Iowa. 145  
 Thomas Grate Bar Co., Birmingham, Ala.

### GRATES (Stationary)

\*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25  
 \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
 \*Murray Iron Works Co., Burlington, Iowa. 145  
 \*Springfield Boiler Co., Springfield, Ill. 192, 193  
 Thomas Grate Bar Co., Birmingham, Ala.

### GRATES (Traveling)

\*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25

### GRATINGS (Floor, Cast Iron)

\*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106

### GRATINGS (Floor, Steel)

\*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 Blaw-Knox Co., Pittsburgh, Pa.

### GRAVEL SCREENING PLANTS

(See Screening Plants)

### GREASE (Axle)

Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Cup)

\*Alumite Corp'n, 1876 Diversy Parkway, Chicago, Ill. 3  
 \*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 \*Sun Oil Co., Philadelphia, Pa. 200  
 Pennzoil Co., Oil City, Pa.  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.  
 Sinclair Refining Co. (Inc.), 45 Nassau St., New York, N. Y.

### GREASE (Cylinder)

\*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157

### GREASE (Fibre)

\*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Gear)

\*Alumite Corp'n, 1876 Diversy Parkway, Chicago, Ill. 3  
 \*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 \*Sun Oil Co., Philadelphia, Pa. 200  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Gear Shield)

\*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157

### GREASE (Graphite)

\*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Gun, Pressure)

\*Alumite Corp'n, 1876 Diversy Parkway, Chicago, Ill. 3  
 \*Ohio Grease Co., 505-635 N. Spring St., Loudonville, Ohio 157  
 \*Sun Oil Co., Philadelphia, Pa. 200

### GREASE (Roll Neck)

\*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Rope)

\*Alumite Corp'n, 1876 Diversy Parkway, Chicago, Ill. 3  
 \*Ohio Grease Co. ("Ohio"), 505-635 N. Spring St., Loudonville, Ohio 157  
 Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE (Wool Yarn)

Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.

### GREASE CUPS, GUNS

(See Cups, Guns)

### GRIDS (Flooring Reinforcing)

(See also Gratings and Plates)

Washburn & Granger (Inc.), 50 Church St., New York, N. Y.

### GRINDERS

(See below and also Crushers, Mills and Pulverizers)



# GRINDERS (Cereal)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
- \*Pulverizing Machinery Co. ("Mikro-Pulverizer"), Roselle Park, N. J. 170

# GRINDERS (Rubber Working)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

# GRINDERS (Wood)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo. 16
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
- Stedman's Foundry & Machine Works, Aurora, Ind.

# GRINDING (Cylinder)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

# GRINDING (General)

- Hart, Frederick, & Co. (Inc.), Box "H," Poughkeepsie, N. Y.

# GRINDING (Roll)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

# GRINDING MACHINERY: See Crushers Pulverizers Mills

# GRINDING MACHINES (Bench)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Chaser)

- Cox & Sons Co., Water & Hampton Sts., Bridgeton, N. J.

# GRINDING MACHINES (Chuckling)

- Bryant Chuckling Grinder Co., Springfield, Vt.

# GRINDING MACHINES (Cutter)

- Washburn Shops, Worcester, Mass.

# GRINDING MACHINES (Cylindrical)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86
- \*Rivett Lathe & Grinder Corp'n, Brighton, Boston, Mass. 177

# GRINDING MACHINES (Drill)

- Washburn Shops, Worcester, Mass.

# GRINDING MACHINES (Face)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Floor)

- \*Safety Grinding Wheel & Machine Co. ("Rite-Speed"), 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Hole & Face)

- Bryant Chuckling Grinder Co., Springfield, Vt.

# GRINDING MACHINES (Internal)

- \*Rivett Lathe & Grinder Corp'n, Brighton, Boston, Mass. 177
- Bryant Chuckling Grinder Co., Springfield, Vt.

# GRINDING MACHINES (Knife)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Portable, Electric)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Portable, Flexible Shaft)

- Strand, N. A., & Co., 5001-5009 N. Lincoln St., Chicago, Ill.

# GRINDING MACHINES (Portable, Pneumatic)

- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio.

# GRINDING MACHINES (Roll)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

# GRINDING MACHINES (Shear Blade)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Surface)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177
- Blanchard Machine Co., 64 State St., Cambridge, Mass.

# GRINDING MACHINES (Swing Frame)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177

# GRINDING MACHINES (Tool)

- \*Safety Grinding Wheel & Machine Co., 2477 Larch St., Springfield, Ohio 177
- Gisholt Machine Co., Madison, Wis.

# GRINDING MACHINES (Tool Post)

- Dunmore Co., 211 16th St., Racine, Wis.

# GRINDING AND SCREEN SEPARATING MACHINERY

(See Pulverizers with Air Separators)

# GRINDING WHEEL DRESSERS

(See Dressers)

# GRINDING WHEELS

(See Wheels)

# GRIT (Steel, for Sand Blast)

(See also Shot)

- \*Pangborn Corp'n, P. O. Box, No. 859, Hagerstown, Md. 160
- \*Sly, W. W., Mfg. Co., 4709 Train Ave., Cleveland, Ohio 191
- Globe Steel Abrasive Co., Mansfield, Ohio.

# GRIZZLIES

(See Screens, Bar and Screens, Rotating Disc)

# GROOVING MACHINES (Journal Bearing)

- Fischer Machine Co., 310 N. 11th St., Philadelphia, Pa.

# GUARDS (Gage Glass)

- Huyette, Paul B., Co. (Inc.), 401 N. Broad St., Philadelphia, Pa.

# GUARDS (Grinding Wheel)

- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

# GUARDS (Machinery, Perforated Metal)

- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

# GUARDS (Machinery, Sheet Metal)

- \*Burt Mfg. Co., 605 Main St., Akron, Ohio 46
- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133
- Pennsylvania Furnace & Iron Co., Warren, Pa.

# GUARDS (Machinery, Wire)

- \*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

# GUNS (Cleaning, Air)

(See Nozzles, Cleaning, Air)

# GUNS (Grease)

- \*Ohio Grease Co., 505-635 N. Spring St., Loudonville, Ohio 157

# GUNS (Grease, Pressure)

- \*Alomite Corp'n, 1876 Diversey Parkway, Chicago, Ill. 3
- \*Ohio Grease Co., 505-635 N. Spring St., Loudonville, Ohio 157

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# HAMMERS (Belt Driven)

- \*Industrial Brownhoist Corp'n, Bay City, Mich. 114
- Quickwork Co., St. Marys, Ohio.

# HAMMERS (Calking, Sealing & Chipping)

- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115

# HAMMERS (Drop, Board)

- Alliance Machine Co., Alliance, Ohio.

# HAMMERS (Motor Driven)

- Brady, C. C. & Son (Inc.), 432 N. Franklin St., Syracuse, N. Y.

# HAMMERS (Pneumatic)

- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill. 197
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

# HAMMERS (Power)

(See Hammers, Belt Driven, Motor Driven and Steam)

# HAMMERS (Rawhide)

- Chicago Rawhide Mfg. Co., 1267-1301 Elston Ave., Chicago, Ill.

# HAMMERS (Riveting & Chipping)

- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115

# HAMMERS (Steam)

- Alliance Machine Co., Alliance, Ohio.

# HAND HOLE FITTINGS

(See Plates and Yokes)

# HANDLES (Machine, Steel)

- Rockwood Sprinkler Co., 38 Harlow St., Worcester, Mass.

# HANDLING SYSTEMS

(See Coal and Ash Handling Machinery, also Conveying Systems)

# HANGER BOXES

(See Boxes)

# HANGERS (Door, Elevator)

- Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.
- Coburn Trolley Track Co., Holyoke, Mass.

# HANGERS (Pipe)

- \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69
- \*Jarecki Mfg. Co., Erie, Pa. 118
- \*Kellogg, M. W., Co., 225 Broadway, New York, N. Y. 127
- Rockwood Sprinkler Co., 38 Harlow St., Worcester, Mass.

# HANGERS (Shaft)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. 142
- Bond, Chas., Co., 617 Arch St., Philadelphia, Pa.
- Bond Foundry & Machine Co., Manheim, Lancaster County, Pa.
- Boston Gear Works (Inc.), N. Quincy, Mass.

# HANGERS (Shaft, Ball Bearing)

- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
- \*SKF Industries (Inc.) ("SKF"), Front St. & Erie Ave., Philadelphia, Pa. 182

# HARDENING (Steel Parts)

- Bantam Ball Bearing Co., South Bend, Ind.

# HARDNESS MEASURING INSTRUMENTS

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- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio 36
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121
- Denison Engrg. Co., Delaware, Ohio

# HAULERS (Log)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121

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- \*Roebling's, John A., Sons Co., Trenton, N. J. 179

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- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69
- \*Kellogg, M. W., Co. ("Masterweld"), 225 Broadway, New York, N. Y. 127

## HEADS (Boiler)

- \*Bethlehem Steel Co. (Inc.), Bethlehem, Pa. 39
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Murray, A. B., Co. (Inc.), 153 Wolcott St., Brooklyn, N. Y. 145
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## HEADS (Die, Pipe & Nipple Threading)

- \*Jarecki Mfg. Co., Erie, Pa. 118

## HEADS (Die, Thread Cutting, Self-Opening)

- Eastern Machine Screw Corp'n, Truman & Barclay Sts., New Haven, Conn.

## HEADS (Exhaust)

- \*Burt Mfg. Co., 605 Main St., Akron, Ohio. 46
- \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69
- \*Granger Machinery Corp'n ("Fulton"), 13 Park Row, New York, N. Y. 106
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- Direct Separator Co. (Inc.), Syracuse, N. Y.

## HEADS (Numbering, Automatic, for Metal)

- Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn.

## HEADS (Tank, Flanged or Dished)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 5, 6, 7

## HEADS (Tubing Oil Well)

- Hughes Tool Co., Houston, Texas

## HEAT EXCHANGERS

- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
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- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
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## HEAT TREATING

- Bantam Ball Bearing Co., South Bend, Ind.
- Clapp, E. D., Mfg. Co., Auburn, N. Y.
- Hart, Frederick & Co. (Inc.), Box "H," Poughkeepsie, N. Y.

## HEATERS (Air)

- \*Air Preheater Corp'n ("Ljungstrom"), 60 E. 42nd St., New York, N. Y. 198, 199
- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*American Blower Corp'n, 6000 Russell St., Detroit, Mich. 9
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44
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- \*Sturtevant, B. F., Co., Hyde Park, Boston, Mass. 196
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- Prat-Daniel Corp'n, Port Chester, N. Y.
- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

## HEATERS (Asphalt)

- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Hauck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. 109
- Connery & Co. (Inc.), 2nd & Lake Sts., Philadelphia, Pa.

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## HEATERS (Domestic Water)

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## HEATERS (Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- \*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. 214
- American Foundry Equipment Co., Mishawaka, Ind.
- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

## HEATERS (Feed Water, Closed)

- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. 59
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Murray Iron Works Company, Burlington, Iowa 145
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185
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## HEATERS (Feed Water, Locomotive)

- \*Superheater Co. ("Elesco"), 60 E. 42nd St., New York, N. Y. 198, 199
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## HEATERS (Feed Water, Open)

- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. 59
- \*Granger Machinery Corp'n ("Cookson"), 13 Park Row, New York, N. Y. 106
- \*Stickle Steam Specialties Co., Indianapolis, Ind. 191
- \*Swartwout Co., 18537 Euclid Ave., Cleveland, Ohio 201
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Elliott Co., Pittsburgh, Pa.

## HEATERS (Fluid, Electric Immersion)

- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

## HEATERS (Gasoline Engine Starting)

- \*Sullivan Machinery Co. ("Start-O"), 402 N. Michigan Ave., Chicago, Ill. 197

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- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2

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- \*Alco Products (Inc.), 220 E. 42nd St., New York, N. Y. 2
- \*Andale Co., 1600 Arch St., Philadelphia, Pa. 18, 19
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Bethlehem Steel Co. (Inc.), Bethlehem, Pa. 39
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Hauck Mfg. Co., 127-137 Tenth St., Brooklyn, N. Y. 109
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. 148
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185

- Coen Co., 915 Bryant St., San Francisco, Cal.
- National Radiator Corp'n, Johnstown, Pa.
- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

## HEATERS (Paraffine Bath)

- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

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## HEATERS (Rivet, Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

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- \*American Gas Furnace Co., Elizabeth, N. J. 223
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20
- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101
- Hones, Charles A. (Inc.), 122 S. Grand Ave., Baldwin, N. Y.

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- \*American District Steam Co. ("Adasco"), N. Tonawanda, N. Y. 12
- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. 59
- \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69

- Burnham Boiler Corp'n, Irvington, N. Y.
- Electric Heater Corp'n Bridgeport, Conn.
- International Heater Co., 101 Park Ave., Utica, N. Y.
- Kewanee Boiler Corp'n, Kewanee, Ill.
- Smith, H. B., Co., Westfield, Mass.

## HEATERS (Water Supply, Electric)

- Electric Heater Corp'n, Bridgeport, Conn.
- Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

## HEATERS (Water Supply, Garbage Burning)

- Kewanee Boiler Corp'n, Kewanee, Ill.

## HEATERS (Water Supply, Gas Burner)

- Eclipse Fuel Engrg. Co., 701-711 S. Main St., Rockford, Ill.

## HEATERS (Water Supply, Instantaneous)

- \*Consolidated Ashcroft Hancock Co. (Inc.), ("Hayden & Derby"), Bridgeport, Conn. 64, 65
- Electric Heater Corp'n, Bridgeport, Conn.

## HEATERS (Water Supply, Oil Burning)

- Automatic Burner Corp'n, 1823 Carroll Ave., Chicago, Ill.

## HEATERS (Water Supply, Steam)

- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. 59
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185

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- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## HEATERS & PURIFIERS (Feed Water, Open, with Oil Extractors Combined)

- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Stickle Steam Specialties Co., Indianapolis, Ind. 191
- \*Swartwout Co., 18537 Euclid Ave., Cleveland, Ohio 201

## HEATERS & PURIFIERS (Open, Feed Water)

- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. 59
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. 60, 61
- \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106
- \*Stickle Steam Specialties Co., Indianapolis, Ind. 191
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## HEATERS & PURIFIERS (Open, Feed Water, Metering)

- \*Cochrane Corp'n ("Cochrane"), 3142 N. 17th St., Philadelphia, Pa. 59

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- Boilers
- Cotts
- Dampers
- Fans
- Heaters
- Heating Systems
- Radiators
- Regulators
- Valves
- Washing Machines (Atr)

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**HEATING ELEMENTS (Electric, Industrial)**

Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

**HEATING MACHINES**

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**HEATING SURFACE ELEMENTS (For Unit Heaters)**

**HEATING SYSTEMS (Hot Water)**

International Heater Co., 101 Park Ave., Utica, N. Y.

**HEATING SYSTEMS (Oil Preheating, Storage Tank)**

**HEATING SYSTEMS (Steam, Exhaust Steam, Vacuum and Vapor)**

(Including Boilers, Piping, Radiators, Valves, Controls, etc.)

\*American Blower Corp'n ("A B C"), ("Sirocco"), 6000 Russell St., Detroit, Mich. 9  
\*Stickle Steam Specialties Co., Indianapolis, Ind. 191

International Heater Co., 101 Park Ave., Utica, N. Y.  
Webster, Warren, & Co., Camden, N. J.

**HEATING SYSTEMS (Unit)**

\*American Blower Corp'n ("Sirocco"), ("Venturaflin"), 6000 Russell St., Detroit, Mich. 9  
\*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44  
\*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
\*Murray Iron Works Company, Burlington, Iowa 145  
\*Stickle Steam Specialties Co., Indianapolis, Ind. 191  
\*Sturtevant, B. F., Co., Hyde Park, Boston, Mass. 196  
\*Wing, L. J., Mfg. Co. ("Feather-Weight"), 57 Seventh Ave., New York, N. Y. 218

American Foundry Equipment Co., Mishawaka, Ind.  
Buckeye Blower Co., Columbus, Ohio.  
Clargue Fan Co., Kalamazoo, Mich.  
Perfex Radiator Co., 415 W. Oklahoma Place, Milwaukee, Wis.  
St. Louis Blow Pipe & Heater Co., 1948 N. Ninth St., St. Louis, Mo.  
Wiegand, Edwin L., Co., 7533 Thomas Blvd., Pittsburgh, Pa.

**HEATING SYSTEMS (Warm Air)**

(Including Furnaces, Pipe, Registers, Controls, etc.)

\*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44  
\*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133  
International Heater Co., 101 Park Ave., Utica, N. Y.  
Pennsylvania Furnace & Iron Co., Warren, Pa.

**HELMETS (Sand Blast)**

\*Pangborn Corp'n, P. O. Box No. 859, Hagerstown, Md. 160  
\*Sly, W. W., Mfg. Co., 4709 Train Ave., Cleveland, Ohio 191

**HERRINGBONE GEARS**

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**HOBBLING MACHINES (Gear)**

Cleveland Hobbling Machine Co., 1170 E. 152nd St., Cleveland, Ohio

**HOISTING CABLES**

(See Wire, Rope)

**HOISTING MACHINERY: See**

Cages Engines  
Capstans Hoists  
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**HOISTS (Air)**

\*Detroit Hoist & Machine Co., 8201 Morrow St., Detroit, Mich. 76  
\*Ingersoll-Rand Co. ("Utility" and "Electric Tugger"), 11 Broadway, New York, N. Y. 115  
\*Sullivan Machinery Co. ("Turbinair"), 402 N. Michigan Ave., Chicago, Ill. 197

**HOISTS (Ash Can)**

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**HOISTS (Chain)**

\*Chisholm-Moore Hoist Corp'n, 5045 Fremont Ave., Tonawanda, N. Y. 56  
\*Ford Chain Block Co., 2nd & Diamond Sts., Philadelphia, Pa. 91

\*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
\*Wright Mfg. Div. of American Chain Co., York, Pa. 220  
\*Yale & Towne Mfg. Co., Philadelphia, Pa. 221

McCollum Hoist & Mfg. Co., Downers Grove, Ill.

**HOISTS (Chain, Multiple Gear)**

\*Ford Chain Block Co., 2nd & Diamond Sts., Philadelphia, Pa. 91

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**HOISTS (Electric)**

\*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115

**HOISTS (Electric, Hook or Trolley)**

\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13  
\*Chisholm-Moore Hoist Corp'n, 5045 Fremont Ave., Tonawanda, N. Y. 56  
\*Detroit Hoist & Machine Co., 8201 Morrow St., Detroit, Mich. 76  
\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
\*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
\*Harnischfeger Corp'n ("P & H"), 4497 W. National Ave., Milwaukee, Wis. 108  
\*Philadelphia Gear Works, Erie Ave. & G St., Philadelphia, Pa. 165  
\*Shepard Niles Crane & Hoist Corp'n ("Liftabout"), 435 Schuyler Ave., Mount Falls, N. Y. 189  
\*Wright Mfg. Div. of American Chain Co., York, Pa. 220  
\*Yale & Towne Mfg. Co., Philadelphia, Pa. 221

Bay State Elevator Co. (Inc.), Springfield, Mass.  
Louden Machinery Co., Fairfield, Iowa  
McCollum Hoist & Mfg. Co., Downers Grove, Ill.  
Shaw Box Crane & Hoist Co. (Inc.), Broadway, Muskegon (Heights P. O.), Mich.

**HOISTS (Friction Drum)**

(See Winches)

**HOISTS (Gasoline)**

(See Winches)

**HOISTS (Hand Power)**

(See Blocks, Tackle; Hoists, Chain or Winches)

**HOISTS (Head Gate)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
\*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
\*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153

Holyoke Machine Co., Holyoke, Mass.

**HOISTS (Locomotive)**

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**HOISTS (Mine)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
Vulcan Iron Works Co., Denver, Colo.

**HOISTS (Monorail)**

(See Hoists, Chain; Hoists, Electric; Trolleys)

**HOISTS (Skip)**

\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio 36  
\*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121  
Otis Elevator Co., 260 Eleventh Ave., New York, N. Y.  
Palmer-Bee Co., Detroit, Mich.  
Robins Conveying Belt Co., 15 Park Row, New York, N. Y.

**HOISTS (Steam)**

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**HOISTS (Tainter Gate)**

\*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
\*Newport News Shipbuilding & Dry Dock Co., Newport News, Va. 153  
\*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. 216, 217

**HOISTS (Telescopic)**

Washburn & Granger (Inc.), 50 Church St., New York, N. Y.

**HOLDERS (Electrode, Welding)**

\*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

**HOLDERS (Gas)**

\*Bartlett Hayward Co., Scott & McHenry Sts., Baltimore, Md. 35  
\*Chicago Bridge & Iron Works ("Horton"), 2131 Old Colony Bldg., Chicago, Ill. 54  
Cruse-Kemper Co., Ambler, Pa.  
Pittsburgh-Des Moines Steel Co., Neville Island P. O., Pittsburgh, Pa.

**HOLDERS (Tool)**

O. K. Tool Co. (Inc.), Shelton, Conn.

**HONES**

\*Carborundum Co. ("Aloxite") ("Carborundum"), Perth Amboy, N. J. 48, 49  
Micromatic Hone Corp'n, 7401 Dubois St., Detroit, Mich.

**HONING MACHINES (Cylinder Bore, etc.)**

\*Barnes Drill Co., 819-837 Chestnut St., Rockford, Ill. 31  
Micromatic Hone Corp'n, 7401 Dubois St., Detroit, Mich.

**HOOKS (Crane)**

\*Roebling's, John A., Sons Co., Trenton, N. J. 179

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\*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13  
\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio 36  
\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52  
\*Chicago Bridge & Iron Works, 2131 Old Colony Bldg., Chicago, Ill. 54  
\*Combustion Engineering Co. (Inc.), ("C-E"), 200 Madison Ave., New York, N. Y. 60, 61  
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\*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121  
\*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133  
\*United Conveyor Corp'n, 1285 Old Colony Bldg., Chicago, Ill. 209  
Convery & Co. (Inc.), 2nd and Lake Sts., Philadelphia, Pa.

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\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio 36  
\*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. 52  
\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
\*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio 120, 121

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**HOSE ATTACHMENTS (Couplings, Bands, Holders, Clamps, etc.)**

\*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69  
\*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115  
\*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio 161  
\*Westinghouse Traction Brake Co., Wilmerding, Pa. 215

**HOSE (Acid)**

\*American Metal Hose Co., Waterbury, Conn. 15  
\*Atlantic Metal Hose Co. (Inc.), 111 W. 64th St., New York, N. Y. 14  
\*Chicago Tubing & Braiding Co., Maywood, Ill. 55  
\*Gates Rubber Co., 999 S. Broadway, Denver, Colo. 96

**HOSE (Air)**

\*American Metal Hose Co., Waterbury, Conn. 15  
\*Atlantic Metal Hose Co. (Inc.), ("Air Flat"), 111 W. 64th St., New York, N. Y. 14  
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- \*Jarecki Mfg. Co., Erie, Pa. 118
- \*Kellogg, M. W., Co., 225 Broadway, New York, N. Y. 127
- \*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio 161

Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

U. S. Pipe & Foundry Co., Burlington, N. J.

## MANIPULATORS (Blooming Mill)

- Alliance Machine Co., Alliance, Ohio.

## MANOMETERS

- \*American Blower Corp'n, ("A B C"), 6000 Russell St., Detroit, Mich. 9
- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio 26, 27
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. 43
- \*Consolidated Ashcroft Hancock Co. (Inc.), ("American"), Bridgeport, Conn. 64, 65
- \*Hays Corp'n, 1042 E. 8th St., Michigan City, Ind. 111
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. 172, 173
- Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

## MARBLE WORKING MACHINERY: See

- Channeling Machines Polishing Machines
- Compressors Saws
- Cranes Tools
- Derricks Winches
- Drilling Windlasses
- Hammers

## MARKING DEVICES

(See Specific Item Desired)

## MARKING MACHINES (Metal)

- Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn.

## MASTICATORS

(See Grinders and Mixers)

## MECHANICAL DRAFT EQUIPMENT: See

- Blowers Manometers
- Fans Preheaters
- Gages

## MECHANICAL STOKERS

(See Stokers)

## METAL BEARINGS, COATINGS, HOSE, PACKING, ETC.

(See Bearings, Coatings, Hose, Packing, etc., Metal)

## METAL SPRAY COATING WORK

- \*Condenser Service & Engrg. Co., 310 12th St., Hoboken, N. J. 62, 63

## METAL WHEEL MACHINERY: See

- Bending Machines Presses
- Dies Riveting Machines
- Flanging Machines Sandblast Units



**METALLURGICAL MACHINERY: See**

Agitators	Flotation Machines
Car Dumpers	Furwices
Casting Machines	Granulators
Classifiers	Grizzlies
Concentrating	Jigs
Machines	Kilns
Converters, Copper	Mills
Conveyors	Rolls, Crushing
Crushers	Samplers, Ore
Dryers	Screens
Elevators	Washing Machines,
Feeders	Ore

**METALS (Acid Resistant)**

*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.	14
*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y.	22, 23, 24, 25
*International Nickel Co. (Inc.), ("Monel Metal"), 67 Wall St., New York, N. Y.	116
*Republic Steel Corp'n, Youngstown, Ohio.	176
Driver-Harris Co., Harrison, N. J.	
General Alloys Co., Boston, Mass.	

**METALS (Bearing)**

*American Brass Co. ("Anaconda"), Waterbury, Conn.	10
*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.	14
*General Electric Co., 1 River Road, Schenectady, N. Y.	98, 99, 100, 101
*Medart Co., 3504 DeKalb St., St. Louis, Mo.	142
Bearium Metals Corp'n, 258 State St., Rochester, N. Y.	

**METALS (Extruded)**  
(See Shapes)

**METALS (Heat Resistant)**

*American Brass Co., Waterbury, Conn.	10
*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.	14
*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y.	22, 23, 24, 25
*International Nickel Co. (Inc.), ("Monel Metal"), 67 Wall St., New York, N. Y.	116
*Republic Steel Corp'n, Youngstown, Ohio.	176
Driver-Harris Co., Harrison, N. J.	
General Alloys Co., Boston, Mass.	
Michigan Steel Casting Co., 1986 Guoin St., Detroit, Mich.	

**METALS (Non-Ferrous)**

*American Brass Co. ("Anaconda") ("Tobin Bronze") ("Ambrac") ("Everdur"), Waterbury, Conn.	10
*American Manganese Bronze Co., Holmesburg, Philadelphia, Pa.	14
*International Nickel Co. (Inc.), ("Monel Metal"), 67 Wall St., New York, N. Y.	116
*Scovill Mfg. Co., Waterbury, Conn.	186

**METALS (Perforated)**

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	5, 6, 7
*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio	133

**METALS (Thermostatic)**

Wilson, H. A., Co., 97 Chestnut St., Newark, N. J.	
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**METALS (Welding)**  
(See Rods, Welding)

**METER BOXES**

(See Boxes, Service, Cast Iron)

**METER PROVERS**

(See Provers)

**METER READING TRANSMITTERS**  
(See Transmitters)

**METERS: See Listing Following and also**

Ameters	Micrometers
Anemometers	Ohmmeters
Barometers	Plantimeters
Calorimeters	Psychrometers
Dynamometers	Saccharometers
Etenometers	Thermometers
Galvanometers	Viscosimeters
Hydrometers	Watt-Hours
Hygrometers	Wattmeters
Manometers	

**METERS (Air)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.	41
*Bristol Co., Waterbury, Conn.	42
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59
*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind.	180

*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Roots-Connorsville Blower Corp'n, 16th St. and Columbia Ave., Connorsville, Ind.	180

New Jersey Meter Co., Plainfield, N. J.

**METERS (Boiler Performance)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Hays Corp'n, 1042 E. 8th St., Michigan City, Ind.	111
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173

**METERS (Carbon Dioxide)**  
(See Gas Analyzers)

**METERS (Chemical Solution)**

*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*National Meter Co., 4207 First Ave., Brooklyn, N. Y.	224
*Neptune Meter Co., 50 W. 50th St., New York, N. Y.	149
*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa.	222

**METERS (CO., Draft & Flue Gas Temperature Combined)**

*Hays Corp'n, 1042 E. 8th St., Michigan City, Ind.	111
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**METERS (Coal)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
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**METERS (Compressed Air)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
New Jersey Meter Co., Plainfield, N. J.	

**METERS (Condensation)**

*American District Steam Co. ("Simplex") ("Adco Rotary"), N. Tonawanda, N. Y.	12
*Neptune Meter Co., 50 W. 50th St., New York, N. Y.	149
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
Central Station Steam Co., 2910 E. Woodbridge St., Detroit, Mich.	

**METERS (Draft, Flue Gas Temperature, Steam Flow and Stoker Speed, Combined)**

*Bailey Meter Co. ("Bailey Boiler Meter"), 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
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**METERS (Electric)**

(See Ammeters, Voltmeters, Wattmeters)

**METERS (Feed Water)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Cochrane Corp'n ("Cochrane"), 3142 N. 17th St., Philadelphia, Pa.	59
*National Meter Co., 4207 First Ave., Brooklyn, N. Y.	224
*Neptune Meter Co., 50 W. 50th St., New York, N. Y.	149
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219
*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa.	222
Buffalo Meter Co., 2923 Main St., Buffalo, N. Y.	
Central Station Steam Co., 2910 E. Woodbridge St., Detroit, Mich.	

**METERS (Feed Water, Weir Type)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Cochrane Corp'n ("Cochrane"), 3142 N. 17th St., Philadelphia, Pa.	59
*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa.	222

**METERS (Flow, Electric)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173

**METERS (Flow, Indicating)**

*American District Steam Co. ("St. John"), N. Tonawanda, N. Y.	12
*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.	41
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59

*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Schutte & Koerting Co. ("Rotameter"), 1165 Thompson St., Philadelphia, Pa.	185

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.  
Foxboro Co., Foxboro, Mass.  
New Jersey Meter Co., Plainfield, N. J.

**METERS (Flow, Recording)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.	41
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Taylor Instrument Co., Rochester, N. Y.	202

Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.  
Foxboro Co., Foxboro, Mass.  
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.  
Tagliabue, C. J., Mfg. Co., Park & Nostrand Aves, Brooklyn, N. Y.

**METERS (Flow, Sewage, Differential Pressure Type)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
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**METERS (Frequency)**

*Bristol Co., Waterbury, Conn.	42
*General Electric Co., 1 River Road, Schenectady, N. Y.	98, 99, 100, 101
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.	
Roller-Smith Co., 2137 Woolworth Bldg., New York, N. Y.	

**METERS (Frequency, Recording)**

*Bristol Co., Waterbury, Conn.	42
*General Electric Co., 1 River Road, Schenectady, N. Y.	98, 99, 100, 101

**METERS (Gas)**

*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.	41
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind.	180
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Roots-Connorsville Blower Corp'n, 16th St. and Columbia Ave., Connorsville, Ind.	180
Foxboro Co., Foxboro, Mass.	

**METERS (Gas, Relative Density)**

*Permutit Co., 330 W. 42nd St., New York, N. Y.	164
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**METERS (Gasoline)**

*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*National Meter Co. ("Empire"), 4207 First Ave., Brooklyn, N. Y.	224
*Neptune Meter Co. ("Trident"), 50 W. 50th St., New York, N. Y.	149
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219

American Liquid Meter Co., 2217 Orange St., Alhambra, Cal.  
Buffalo Meter Co., 2923 Main St., Buffalo, N. Y.  
Oil Conservation Engineering Co., 877 Addison Road, Cleveland, Ohio

**METERS (Notch)**

(See Meters, Weir Type)

**METERS (Oil)**

*Anthony Co., 47-33 Fifth St., Long Island City, N. Y.	20
*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio	26, 27
*Brassert, H. A., & Co., 310 S. Michigan Ave., Chicago, Ill.	41
*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa.	43
*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59
*Connorsville Blower Co., 16th St. and Columbia Ave., Connorsville, Ind.	180
*National Meter Co. ("Empire"), 4207 First Ave., Brooklyn, N. Y.	224
*Neptune Meter Co. ("Trident"), 50 W. 50th St., New York, N. Y.	149
*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill.	172, 173
*Roots-Connorsville Blower Corp'n, 16th St. and Columbia Ave., Connorsville, Ind.	180
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219

American Liquid Meter Co., 2217 Orange St., Alhambra, Cal.  
Buffalo Meter Co., 2923 Main St., Buffalo, N. Y.  
Oil Conservation Engineering Co., 877 Addison Road, Cleveland, Ohio



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- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio .....26, 27
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. ....172, 173

## METERS (pH Concentration)

- Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.

## METERS (Pilot Tube)

- \*American Blower Corp'n ("A B C"), 6000 Russell St., Detroit, Mich. ....9
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. ....43
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. ....172, 173
- Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

## METERS (Steam)

- \*American District Steam Co., N. Tonawanda, N. Y. ....12
- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio .....26, 27
- \*Brassert, H. A. & Co., 310 S. Michigan Ave., Chicago, Ill. ....41
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. ....43
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. ....59
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. ....172, 173
- Foxboro Co., Foxboro, Mass.

## METERS (Testing, Portable)

(See Provers, Meter)

## METERS (Thrust Shaft Bearing)

- \*Kingsbury Machine Works (Inc.), 4326 Tackawanna St., Philadelphia, Pa. ....132

## METERS (Venturi)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio .....26, 27
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. ....43
- \*National Meter Co. ("Premier"), 4207 First Ave., Brooklyn, N. Y. ....224
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. ....172, 173

## METERS (Water)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio .....26, 27
- \*Brassert, H. A. & Co., 310 S. Michigan Ave., Chicago, Ill. ....41
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. ....43
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. ....59
- \*National Meter Co. ("Crown") ("Empire") ("Nash") ("Premier") ("Gem"), 4207 First Ave., Brooklyn, N. Y. ....224
- \*Neptune Meter Co. ("Trident"), 50 W. 50th St., New York, N. Y. ....149
- \*Republic Flow Meters Co., 2242 Diversey Parkway, Chicago, Ill. ....172, 173
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. ....219
- \*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa. ....222
- Buffalo Meter Co., 2923 Main St., Buffalo, N. Y.
- Foxboro Co., Foxboro, Mass.
- Smith, A. P. Mfg. Co., East Orange, N. J.

## METERS (Water Hardness Concentration)

(See Test Sets, Boiler Water Hardness)

## METERS (Watt-Hour)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. ....98, 99, 100, 101
- \*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. ....214

## METERS (Weir Type)

- \*Bailey Meter Co., 1034 Ivanhoe Road, Cleveland, Ohio .....26, 27
- \*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa. ....59
- \*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa. ....222

## MICROMETERS (Roll)

- \*Farrel-Birmingham Company (Inc.), Main and State Sts., Ansonia, Conn. ....86

## MICROSCOPES

- Fuess, R. (Inc.), 245 West 55th St., New York, N. Y.

## MILL WEARING PARTS: See

- Balls
- Castings, Wear
- Resistant
- Linings
- Rolls

## MILLIAMMETERS

- \*Bristol Co., Waterbury, Conn. ....42
- \*General Electric Co., 1 River Road, Schenectady, N. Y. ....98, 99, 100, 101
- Roller-Smith Co., 2137 Woolworth Bldg., New York, N. Y.

## MILLING MACHINES (Hand)

- Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio

## MILLING MACHINES (Manufacturing)

- Consolidated Machine Tool Corp'n, Rochester, N. Y.

## MILLING MACHINES (Mill Slab)

- Torrington Mfg. Co., 70 Franklin St., Torrington, Conn.

## MILLING MACHINES (Plain)

- Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio

## MILLING MACHINES (Thread)

- Waltham Machine Works, 296 Newton St., Waltham, Mass.

## MILLIVOLTMETERS

- \*Bristol Co., Waterbury, Conn. ....42
- \*Brown Instrument Co., 4496 Wayne Ave., Philadelphia, Pa. ....43
- \*General Electric Co., 1 River Road, Schenectady, N. Y. ....98, 99, 100, 101
- Roller-Smith Co., 2137 Woolworth Bldg., New York, N. Y.

## MILLIVOLTMETERS (Pyrometer)

- Roller-Smith Co., 2137 Woolworth Bldg., New York, N. Y.

## MILLS

(See below and also Crushers, Grinders and Pulverizers)

## MILLS (Attrition)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Hardinge Co. (Inc.), York, Pa. ....107

## MILLS (Ball)

- \*Allis-Chalmers Mfg. Co. ("Compeh"), Milwaukee, Wis. ....4, 5, 6, 7
- \*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y. ....22, 23, 24, 25
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. ....60, 61
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## MILLS (Cinder)

- \*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo. ....16
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....120, 121
- \*Sly, W. W. Mfg. Co., 4709 Train Ave., Cleveland, Ohio ....191

## MILLS (Cinder, Tumbling)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Sly, W. W. Mfg. Co., 4709 Train Ave., Cleveland, Ohio ....191

## MILLS (Comminuting)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37

## MILLS (Crushing, Sugar Cane)

- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....120, 121

## MILLS (Grinding)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7
- \*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo. ....16
- \*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y. ....22, 23, 24, 25
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....120, 121
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## \*Pulverizing Machinery Co. ("Mikro-Pulverizer")

- Roselle Park, N. J. ....170
- \*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. ....216, 217
- Prosser, Thomas & Son, 15 Gold St., New York, N. Y.
- Stedman's Foundry & Machine Works, Aurora, Ind.

## MILLS (Grinding Pan)

- National Engrg. Co., 549 W. Washington Blvd., Chicago, Ill.

## MILLS (Hammer)

- \*Allis-Chalmers Mfg. Co. ("Pulverator"), Milwaukee, Wis. ....4, 5, 6, 7
- \*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo. ....16
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y. ....60, 61
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....120, 121
- \*Pulverizing Machinery Co. ("Mikro-Pulverizer"), Roselle Park, N. J. ....170
- Stedman's Foundry & Machine Works, Aurora, Ind.

## MILLS (Laboratory)

(See Mills, Jar)

## MILLS (Pebble)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## MILLS (Pug)

- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36
- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio ....120, 121

## MILLS (Rod)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## MILLS, ROLLER (Celluloid, Linoleum, Rubber & Like Materials)

- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86

## MILLS, ROLLER (Flour, Cereals, Corn, Chemicals, etc.)

(See Grinders)

## MILLS, ROLLING (Cold Strip or Wire)

- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86
- Torrington Mfg. Co., 70 Franklin St., Torrington, Conn.

## MILLS, ROLLING (For Copper, Lead and other Soft Materials)

- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86
- \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. ....178

## MILLS, ROLLING (Steel, Bar, Sheet, Structural Shapes, etc.)

- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## MILLS (Rubber Working)

- \*Farrel-Birmingham Company (Inc.), Main & State Sts., Ansonia, Conn. ....86

## MILLS (Sand, Steel Foundry)

- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ....36

## MILLS (Stamp)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7

## MILLS (Tube)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7
- \*Beach-Russ Co., 46 Church St., New York, N. Y. ....37
- \*Hardinge Co. (Inc.), York, Pa. ....107
- \*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y. ....130

## MILLS (Tumbling, Foundry)

- \*Sly, W. W. Mfg. Co., 4709 Train Ave., Cleveland, Ohio ....191
- \*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. ....216, 217



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## MIXERS (Clay, Fertilizer, etc.)

\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ..... 36

National Engrg. Co., 549 W. Washington Blvd., Chicago, Ill.  
Stedman's Foundry & Machine Works, Aurora, Ind.

## MIXERS (Color)

\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ..... 36

\*Beach-Russ Co., 46 Church St., New York, N. Y. .... 37

## MIXERS (Concrete)

\*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. .... 52

## MIXERS (Continuous)

\*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio ..... 36

National Engrg. Co., 549 W. Washington Blvd., Chicago, Ill.

## MIXERS (Dough)

\*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. .... 84

## MIXERS (Gas & Air)

\*Brassert, H. A. & Co., 310 S. Michigan Ave., Chicago, Ill. .... 41

Elipse Fuel Engrg. Co., 701-711 S. Main St., Rockford, Ill.  
Hones, Charles A. (Inc.), 122 S. Grand Ave., Baldwin, N. Y.

## MIXERS (Glue)

Francis, Chas. E., Co., Rushville, Ind.

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\*Allis-Chalmers Mfg. Co., Milwaukee, Wis. ....4, 5, 6, 7

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Mahbs Hydraulic Packing Co., 431 S. Dearborn St., Chicago, Ill.

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- \*Divine Bros. Co., Hotel & Whitesboro Sts., Utica, N. Y. 79

## POTS (Glue, Steam-Heated)

- \*Divine Bros. Co., Hotel & Whitesboro Sts., Utica, N. Y. 79

## POTS (Hardening and Tempering)

- Driver-Harris Co., Harrison, N. J.  
 Eclipse Fuel Engrg. Co., 701-711 S. Main St., Rockford, Ill.  
 General Alloys Co., Boston, Mass.

## POTS (Lead)

- \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25  
 \*Busch-Sulzer Bros.-Diesel Engine Co., St. Louis, Mo. 47  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178  
 Driver-Harris Co., Harrison, N. J.  
 General Alloys Co., Boston, Mass.

## POTS (Solder Melting, Electric)

- \*General Electric Co., 1 River Road, Schenectady, N. Y. 98, 99, 100, 101

## POWER TRANSMISSION MACHINERY:

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| <i>See</i>    |                      |
| Bearings      | Frictions            |
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| Belts         | Hangers              |
| Blocks        | Idlers               |
| Borers        | Pulleys              |
| Brackets      | Racks                |
| Chains        | Shafting             |
| Clutches      | Sheaves              |
| Collars       | Shifters             |
| Countershafts | Speed Reducing Units |
| Couplings     | Sprockets            |
| Drives        | Take Ups             |
| Facings       | Tighteners           |
| Floor Stands  | Wheels, Fly          |

## POWER UNITS (Alcohol)

- Hercules Motors Corp'n, Canton, Ohio.

## POWER UNITS (Gas, Natural)

- Hercules Motors Corp'n, Canton, Ohio.

## POWER UNITS (Gasoline)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 Hercules Motors Corp'n, Canton, Ohio.  
 Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

## POWER UNITS (Kerosene)

- Hercules Motors Corp'n, Canton, Ohio.

## POWER UNITS (Oil, Diesel)

- Hercules Motors Corp'n, Canton, Ohio.

## POWERS (Oil Well)

- (See Pumping Powers)

## PREHEATERS (Air)

- \*Air Preheater Corp'n ("Ljungstrom"), 60 E. 42nd St., New York, N. Y. 198, 199  
 \*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25  
 \*Buffalo Forge Co., 495 Broadway, Buffalo, N. Y. 44  
 \*Combustion Engineering Co. (Inc.) ("C-E"), 200 Madison Ave., New York, N. Y. 60, 61  
 \*Riley Stoker Corp'n, Worcester, Mass. 174, 175  
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 Prat-Daniel Corp'n, Port Chester, N. Y.

## PREHEATERS (Welding)

- (See Torches)

## PRESSED STEEL PRODUCTS

- (See Shapes, Steel, Pressed)

## PRESSES (Arbor)

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13  
 \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 Bartlett, Edwin E., Co., 41 Crown St., Nashua, N. H.  
 Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.

## PRESSES (Assembling and Riveting)

- (See Riveting Machines)

## PRESSES (Baling)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 Cox & Sons Co., Water & Hampton Sts., Bridgeton, N. J.

## PRESSES (Banding)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## PRESSES (Blanking)

- \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## PRESSES (Blanking, Veneer and Card-board Stock)

## PRESSES (Blocking & Briquetting)

- \*Carver, Fred S., 349 Hudson St., New York, N. Y. 50  
 \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Broaching)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 Bartlett, Edwin E., Co., 41 Crown St., Nashua, N. H.

## PRESSES (Casting, Straightening)

- (See Presses, Straightening)

## PRESSES (Cocoa Butter)

- (See Presses, Filter, or Presses, Juice, Oil, Fat, etc.)

## PRESSES (Draw)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Embossing)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Extruding)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Fibre Board)

- (See Presses, Drying, Hot and Cold Plate, Platen)

## PRESSES (Filter)

- \*Carver, Fred S., 349 Hudson St., New York, N. Y. 50  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178  
 Independent Filter Press Co. (Inc.), 189 7th St., Brooklyn, N. Y.

## PRESSES (Filter, Paraffine Wax)

- \*Vogt, Henry, Machine Co., Louisville, Ky. 212

## PRESSES (Flanging)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## PRESSES (Forcing, Hydraulic)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Forcing, Power)

- (See Presses, Arbor)

## PRESSES (Forging)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Forming)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

## PRESSES (Horning, Wiring or Riveting)

## PRESSES (Hot & Cold Plate)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86

## PRESSES (Hydraulic)

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13  
 \*Carver, Fred S., 349 Hudson St., New York, N. Y. 50  
 \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Farrel-Birmingham Co. (Inc.), Main & State Sts., Ansonia, Conn. 86  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178  
 Dudgeon, Richard (Inc.), 82 Broome St., New York, N. Y.  
 Dunning & Boschert Press Co. (Inc.) Syracuse, N. Y.  
 Francis, Chas. E., Co., Rushville, Ind.  
 Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.  
 Holyoke Machine Co., Holyoke, Mass.  
 Hydraulic Press Mfg. Co., 500 Lincoln Ave., Mt. Gilead, Ohio.  
 Oilgear Co., 1399 W. Bruce St., Milwaukee, Wis.

## PRESSES (Hydraulic, Laboratory)

- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. 13  
 \*Carver, Fred S., 349 Hudson St., New York, N. Y. 50  
 \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84

## PRESSES (Hydro-Pneumatic)

- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84

## PRESSES (Hydrostatic Testing)

- \*Carver, Fred S., 349 Hudson St., New York, N. Y. 50  
 \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. 84  
 \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178

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- \*Robertson, John, Co. (Inc.), 125 Water St., Brooklyn, N. Y. 178



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- Bartlett, Edw'n E., Co., 41 Crown St., Nashua, N. H. ....
- Hydraulic Press Mfg. Co., 500 Lincoln Ave., Mt. Gilead, Ohio. ....

## PRESSES (Oil, Fat, Juice, etc.)

- \*Carver Fred S., 349 Hudson St., New York, N. Y. .... 50
- \*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill. .... 84

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## PRIMERS (Pump, for Centrifugals)

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- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. .... 4, 5, 6, 7
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- \*Barrett, Haentjens & Co. ("Hazleton"), Hazleton, Pa. .... 32, 33
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## PRINTING MACHINES (Blue Print)

- Pease, C. F., Co., 826 N. Franklin St., Chicago, Ill. ....

## PRINTING MACHINES (Textile)

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- \*American Engineering Co., 2412 Aramingo Ave., Philadelphia, Pa. .... 13
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- \*Link-Belt Co., Caldwell-Moore Plant, 2410 W. 18th St., Chicago, Ill. .... 136
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## PULLEYS (Flanged)

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- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. .... 142
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- \*Chain Belt Co., 1630 W. Bruce St., Milwaukee, Wis. .... 52

- \*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio .... 120, 121
- \*McMahon & Co., Water St. Cor. Ledge St., Worcester, Mass. .... 140
- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. .... 142
- \*Twin Disc Clutch Co., 1322 Racine St., Racine, Wis. .... 208
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- \*Medart Co., 3504 DeKalb St., St. Louis, Mo. .... 142

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- |                   |                      |
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| Crushers          | Separators           |
| Dryers            | Pulverizers          |
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## PULVERIZERS

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- \*Allis-Chalmers Mfg. Co. ("Pulverator"), Milwaukee, Wis. .... 4, 5, 6, 7
- \*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo. .... 16
- \*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y. .... 22, 23, 24, 25
- \*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio. .... 36
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- \*Pulverizing Machinery Co. ("Mikro-Pulverizer"), Roselle Park, N. J. .... 170
- \*Riley Stoker Corp'n ("Riley"), Worcester, Mass. .... 174, 175
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*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
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Stedman's Foundry & Machine Works, Aurora, Ind.

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*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
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*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y.	22, 23, 24, 25
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*Allis-Chalmers Mfg. Co. ("Pulverator"), Milwaukee, Wis.	4, 5, 6, 7
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*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y.	130
*Riley Stoker Corp'n, Worcester, Mass.	174, 175

Pennsylvania Crusher Co., Liberty Trust Bldg., Philadelphia, Pa.  
Stedman's Foundry & Machine Works, Aurora, Ind.

## PULVERIZERS (Phosphate Rock)

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y.	22, 23, 24, 25
*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio	36
*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Combustion Engineering Co. (Inc.) ("Raymond"), 200 Madison Ave., New York, N. Y.	60, 61
*Hardinge Co. (Inc.), York, Pa.	107
*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio	120, 121
*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y.	130
*Riley Stoker Corp'n, Worcester, Mass.	174, 175

## PULVERIZERS (Refractory Materials)

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
*Babcock & Wilcox Co., 85 Liberty St., New York, N. Y.	22, 23, 24, 25
*Bartlett & Snow Co., C. O., 6450 Harvard Ave., Cleveland, Ohio	36
*Combustion Engineering Co. (Inc.) ("Raymond"), 200 Madison Ave., New York, N. Y.	60, 61
*Hardinge Co. (Inc.), York, Pa.	107
*Jeffrey Mfg. Co., 904-99 N. 4th St., Columbus, Ohio	120, 121
*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y.	130
*Riley Stoker Corp'n, Worcester, Mass.	174, 175

## PULVERIZERS (Ring Type)

*American Pulverizer Co., 1239 Macklind Ave., St. Louis, Mo.	16
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Stedman's Foundry & Machine Works, Aurora, Ind.

## PULVERIZERS WITH AIR SEPARATORS

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*Babcock & Wilcox Co. ("B & W"), 85 Liberty St., New York, N. Y.	22, 23, 24, 25
*Combustion Engineering Co. (Inc.), 200 Madison Ave., New York, N. Y.	60, 61
*Hardinge Co. (Inc.), York, Pa.	107
*Kennedy-Van Saun Mfg. & Eng. Corp'n, 2 Park Ave., New York, N. Y.	130
*Riley Stoker Corp'n, Worcester, Mass.	174, 175
*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill.	216, 217

Strong-Scott Mfg. Co., Minneapolis, Minn.

## PUMP GOVERNORS, LINERS, VALVES, ETC.)

(See Governors, Liners, Valves, etc., Pump)

## PUMP PRIMERS (Centrifugal): See

Injectors	Pumps
Primers	Siphons

## PUMPING ENGINES

(See Engines, Pumping)

## PUMPING OUTFITS

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*American Steam Pump Co., Battle Creek, Mich.	17
*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y.	45
*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill.	56
*Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind.	180
*Dean Hill Pump Co., Anderson, Ind.	75
*DeLaval Steam Turbine Co., Trenton, N. J.	73
*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill.	81
*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.	85
*Gaso Pump & Burner Mfg. Co., Tulsa, Okla.	95

*Goulds Pumps (Inc.), Seneca Falls, N. Y.	102
*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.	115
*Jarecki Mfg. Co., Erie, Pa.	118
*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J.	134
*Moore Steam Turbine Corp'n, Wellsville, N. Y.	144
*Morris Machine Works, Baldwinsville, N. Y.	141
*Pennsylvania Pump & Compressor Co., Easton, Pa.	163
*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind.	180
*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa	213
*Westinghouse Traction Brake Co., Wilmerding, Pa.	215
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219

## PUMPING OUTFITS (Acid, Vacuum)

*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J.	134

## PUMPING OUTFITS (Fuel Oil)

*American Steam Pump Co., Battle Creek, Mich.	17
*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y.	45
*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind.	180
*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.	85
*Goulds Pumps (Inc.), Seneca Falls, N. Y.	102
*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J.	134
*National Aircell Burner Co., 1327 Girard Ave., Philadelphia, Pa.	148
*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind.	180

Waterbury Tool Co., Waterbury, Conn.

## PUMPING POWERS

*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill.	197
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Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.

## PUMPING SYSTEMS (Air Lift)

*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Granger Machinery Corp'n ("Milwaukee"), 13 Park Row, New York, N. Y.	106
*Ingersoll-Rand Co., 11 Broadway, New York, N. Y.	115
*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J.	134
*Norwalk Co. (Inc.), 15 Water St., So. Norwalk, Conn.	156
*Pennsylvania Pump & Compressor Co., Easton, Pa.	163
*Sullivan Machinery Co. ("Air-Made Wells"), 402 N. Michigan Ave., Chicago, Ill.	197
*United States Hoffman Machinery Corp'n, 103 Fourth Ave., New York, N. Y.	210
*Westinghouse Traction Brake Co., Wilmerding, Pa.	215
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219

## PUMPING UNITS (Oil Well, Geared)

Parkersburg Rig & Reel Co., Parkersburg, W. Va.

## PUMPS (Acid)

*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y.	45
*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill.	56
*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind.	180
*Dayton-Dowd Co., Quincy, Ill.	72
*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind.	74
*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill.	81
*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.	85
*Gaso Pump & Burner Mfg. Co., Tulsa, Okla.	95
*Goulds Pumps (Inc.), Seneca Falls, N. Y.	102
*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y.	115
*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J.	134
*Morris Machine Works, Baldwinsville, N. Y.	141
*Pennsylvania Pump & Compressor Co., Easton, Pa.	163
*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind.	180
*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa.	185
*Sharples Specialty Co. ("Barnett"), 2357 Westmoreland St., Philadelphia, Pa.	188
*Sullivan Machinery Co., 402 N. Michigan Ave., Chicago, Ill.	197
*Worthington Pump & Machinery Corp'n, Harrison, N. J.	219

Chemical Equipment Co. (Inc.), Montpelier, Ind.



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Duriron Co. (Inc.), Dayton, Ohio.  
 Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Willey, A. R., & Sons (Inc.), P. O. Box 2330, Denver, Colo.  
 Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Air)

(See Pumps, Vacuum)

## PUMPS (Air Lift)

(See Pumping Systems, Air Lift)

## PUMPS (Alkali)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Weiman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.  
 Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Ammonia)

\*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
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 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
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 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Vogt, Henry, Machine Co., Louisville, Ky. 212  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## PUMPS (Ash)

(See Pumps, Sand)

## PUMPS (Bilge)

\*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
 \*DeLaval Steam Turbine Co., Trenton, N. J. 73  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
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Pulsometer Steam Pump Co., 485 S. 21st St., Irvington, N. J.  
 Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Schleyer, E. C., Pump Co., Anderson, Ind.  
 Weil Pump Co., 215-17 W. Superior St., Chicago, Ill.  
 Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Bilge, Rotary)

\*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180

## PUMPS (Boiler Feed)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
 \*Dean Hill Pump Co., Anderson, Ind. 75  
 \*DeLaval Steam Turbine Co., Trenton, N. J. 73  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Granger Machinery Corp'n, 13 Park Row, New York, N. Y. 106  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
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 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.  
 Weil Pump Co., 215-17 W. Superior St., Chicago, Ill.  
 Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Boiler Feed, Locomotive)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*Superheater Co. ("Elesco"), 60 E. 42nd St., New York, N. Y. 198, 199  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## PUMPS (Brine)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
 \*Dean Hill Pump Co., Anderson, Ind. 75  
 \*DeLaval Steam Turbine Co., Trenton, N. J. 73  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Sharples Specialty Co. ("Barnett"), 2357 Westmoreland St., Philadelphia, Pa. 188  
 \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Schleyer, E. C., Pump Co., Anderson, Ind.  
 Viking Pump Co., Cedar Falls, Iowa.  
 Weil Pump Co., 215-17 W. Superior St., Chicago, Ill.  
 Weiman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.  
 Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Centrifugal)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Barrett, Haentjens & Co. ("Hazleton"), Hazleton, Pa. 32, 33  
 \*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45

\*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Hill Pump Co., Anderson, Ind. 75  
 \*DeLaval Steam Turbine Co., Trenton, N. J. 73  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Nash Engineering Co. ("Jennings"), 201 Wilson Road, South Norwalk, Conn. 146, 147  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Sharples Specialty Co. ("Barnett"), 2357 Westmoreland St., Philadelphia, Pa. 188  
 \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

Ellicott Machine Corp'n, 1611 Bush St., Baltimore, Md.  
 Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Reid, Joseph, Gas Engine Co., Box 177, Oil City, Pa.  
 Schleyer, E. C., Pump Co., Anderson, Ind.  
 Tomkins-Johnson Co., 617 N. Mechanic St., Jackson, Mich.  
 Weil Pump Co., 215-17 W. Superior St., Chicago, Ill.  
 Weiman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.  
 Yeomans Bros. Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Centrifugal, with Included Primer)

\*Nash Engineering Co. ("Jennings"), 201 Wilson Road, South Norwalk, Conn. 146, 147  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## PUMPS (Chemical)

\*Allis - Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7  
 \*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56  
 \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Gaso Pump & Burner Mfg. Co., Tulsa, Okla. 95  
 \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
 \*Morris Machine Works, Baldwinville, N. Y. 141  
 \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163  
 \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180  
 \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185  
 \*Sharples Specialty Co. ("Barnett"), 2357 Westmoreland St., Philadelphia, Pa. 188  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.  
 Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Condensation, with Automatic Receiver)

\*American Steam Pump Co., Battle Creek, Mich. 17  
 \*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
 \*Chicago Pump Co. ("Sure-Return"), 2334 Wolfram St., Chicago, Ill. 56  
 \*Dayton-Dowd Co., Quincy, Ill. 72  
 \*Dean Brothers Co., 331 W. 10th St., Indianapolis, Ind. 74  
 \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81  
 \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85  
 \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102  
 \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134  
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Weil Pump Co., 215-17 W. Superior St., Chi-  
cago, Ill. . . . .

Weinman Pump Mfg. Co., 270-280 Spruce St.,  
Columbus, Ohio. . . . .

Yeomans Bros. Co., 1433 Dayton St., Chi-  
cago, Ill. . . . .

## PUMPS (Deep Well)

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*Fairbanks, Morse & Co., 900 S. Wabash  
Ave., Chicago, Ill. . . . . 85

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Granger Machinery Corp'n ("Milwaukee"),  
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\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
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\*Jarecki Mfg. Co., Erie, Pa. . . . . 118

\*Westco Pump Corp'n, Gains & Front Sts.,  
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\*Worthington Pump & Machinery Corp'n,  
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## PUMPS (Diaphragm)

\*Chain Belt Co. ("Rex"), 1630 W. Bruce  
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\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

## PUMPS (Dredging)

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Worthington Pump & Machinery Corp'n,  
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Ellicott Machine Corp'n, 1611 Bush St.,  
Baltimore, Md. . . . .

## PUMPS (Dry Vacuum)

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## PUMPS (Electric)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
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\*Barrett, Haentjens & Co. ("Hazleton"),  
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\*Beach-Russ Co., 46 Church St., New York,  
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\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
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\*Chicago Pump Co., 2334 Wolfram St., Chi-  
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\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
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\*Fairbanks, Morse & Co., 900 S. Wabash  
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Schleyer, E. C., Pump Co., Anderson, Ind.  
Weil Pump Co., 215-17 W. Superior St., Chi-  
cago, Ill. . . . .

Weinman Pump Mfg. Co., 270-280 Spruce  
St., Columbus, Ohio. . . . .

Yeomans Brothers Co., 1433 Dayton St.,  
Chicago, Ill. . . . .

## PUMPS (Elevator)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Chicago Pump Co., 2334 Wolfram St., Chi-  
cago, Ill. . . . . 56

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Brothers Co., 331 W. Tenth St., In-  
dianapolis, Ind. . . . . 74

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Pennsylvania Pump & Compressor Co.,  
Easton, Pa. . . . . 163

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

Quimby Pump Co. (Inc.), 339 Thomas St.,  
Newark, N. J. . . . .

Yeomans Brothers Co., 1433 Dayton St., Chi-  
cago, Ill. . . . .

## PUMPS (Filter Press)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Chicago Pump Co., 2334 Wolfram St., Chi-  
cago, Ill. . . . . 56

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Brothers Co., 331 W. Tenth St., In-  
dianapolis, Ind. . . . . 74

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Kraissl Co. (Inc.), Harper Terminal, 622  
Main St., Hackensack, N. J. . . . . 134

\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

Quimby Pump Co. (Inc.), 339 Thomas St.,  
Newark, N. J. . . . .

Yeomans Brothers Co., 1433 Dayton St., Chi-  
cago, Ill. . . . .

## PUMPS (Fire)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Chicago Pump Co., 2334 Wolfram St., Chi-  
cago, Ill. . . . . 56

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Fairbanks, Morse & Co., 900 S. Wabash  
Ave., Chicago, Ill. . . . . 85

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Kraissl Co. (Inc.), Harper Terminal, 602  
Main St., Hackensack, N. J. . . . . 134

\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Pennsylvania Pump & Compressor Co.,  
Easton, Pa. . . . . 163

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

Waterous Co., St. Paul, Minn. . . . .

## PUMPS (Gas)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Connorsville Blower Co., 16th St. & Colum-  
bia Ave., Connorsville, Ind. . . . . 180

\*Gaso Pump & Burner Mfg. Co., Tulsa,  
Okla. . . . . 95

\*Ingersoll-Rand Co., 11 Broadway, New  
York, N. Y. . . . . 115

\*Kraissl Co. (Inc.), Harper Terminal, 622  
Main St., Hackensack, N. J. . . . . 134

\*Roots-Connorsville Blower Corp'n, 16th St.  
& Columbia Ave., Connorsville, Ind. . . . . 180

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

Crowell Mfg. Co., 319 Franklin Ave., Brook-  
lyn, N. Y. . . . .

## PUMPS (Gas Power)

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Gaso Pump & Burner Mfg. Co., Tulsa,  
Okla. . . . . 95

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Kraissl Co. (Inc.), Harper Terminal, 622  
Main St., Hackensack, N. J. . . . . 134

## PUMPS (Gasoline Engine Driven)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Chain Belt Co. ("Rex"), 1630 W. Bruce  
St., Milwaukee, Wis. . . . . 52

\*Chicago Pump Co., 2334 Wolfram St., Chi-  
cago, Ill. . . . . 56

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Fairbanks, Morse & Co., 900 S. Wabash  
Ave., Chicago, Ill. . . . . 85

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Pennsylvania Pump & Compressor Co.,  
Easton, Pa. . . . . 163

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

Weinman Pump Mfg. Co., 270-280 Spruce  
St., Columbus, Ohio. . . . .

Yeomans Bros. Co., 1433 Dayton St., Chi-  
cago, Ill. . . . .

## PUMPS (Gear)

(See Pumps, Rotary)

## PUMPS (Hand)

\*Anthony Co., 47-33 Fifth St., Long Island  
City, N. Y. . . . . 20

\*Beach-Russ Co., 46 Church St., New York,  
N. Y. . . . . 37

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Kraissl Co. (Inc.), Harper Terminal, 622  
Main St., Hackensack, N. J. . . . . 134

## PUMPS AND HEATERS COMBINED

(See Heaters and Pumps, Combined)

## PUMPS (Hydraulic Pressure)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Carver, Fred S., 349 Hudson St., New  
York, N. Y. . . . . 50

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Brothers Co., 331 W. Tenth St., In-  
dianapolis, Ind. . . . . 74

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Elmes, Charles F., Engrg. Works, 215 N.  
Morgan St., Chicago, Ill. . . . . 84

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
way, New York, N. Y. . . . . 115

\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Robertson, John, Co. (Inc.), 125 Water St.,  
Brooklyn, N. Y. . . . . 178

\*Worthington Pump & Machinery Corp'n,  
Harrison, N. J. . . . . 219

American Fluid Motors Co., 2412 Aramingo  
Ave., Philadelphia, Pa. . . . .

Denison Engrg. Co., Delaware, Ohio. . . . .

Dudgeon, Richard (Inc.), 82 Broome St.,  
New York, N. Y. . . . .

Dunning & Boschert Press Co. (Inc.), Syra-  
cuse, N. Y. . . . .

"Friend" Mfg. Co., Gasport, N. Y. . . . .

Hydraulic Press Mfg. Co., 500 Lincoln Ave.,  
Mt. Glen, Ohio. . . . .

Oilgear Co., 1399 W. Bruce St., Milwaukee,  
Wis. . . . .

Viking Pump Co., Cedar Falls, Iowa. . . . .

Waterbury Tool Co., Waterbury, Conn. . . . .

## PUMPS (Inspectors Test)

\*Consolidated Ashcroft Hancock Co. (Inc.),  
Bridgeport, Conn. . . . . 64, 65

\*Crosby Steam Gate & Valve Co., 10 Roland  
St., Boston, Mass. . . . . 70

Ashton Valve Co., 161 First St., Cambridge,  
Mass. . . . .

## PUMPS (Irrigation)

\*Allis-Chalmers Mfg. Co., Milwaukee,  
Wis. . . . . 4, 5, 6, 7

\*American Steam Pump Co., Battle Creek,  
Mich. . . . . 17

\*Buffalo Pumps (Inc.), 495 Broadway, Buf-  
falo, N. Y. . . . . 45

\*Chicago Pump Co., 2334 Wolfram St., Chi-  
cago, Ill. . . . . 56

\*Connorsville Blower Co., 16th St. & Colum-  
bia Ave., Connorsville, Ind. . . . . 180

\*Dayton-Dowd Co., Quincy, Ill. . . . . 72

\*Dean Hill Pump Co., Anderson, Ind. . . . . 75

\*DeLaval Steam Turbine Co., Trenton, N. J. . . . . 73

\*Economy Pumping Machinery Co., 3431 W.  
48th Place, Chicago, Ill. . . . . 81

\*Fairbanks, Morse & Co., 900 S. Wabash  
Ave., Chicago, Ill. . . . . 85

\*Goulds Pumps (Inc.), Seneca Falls, N. Y. . . . . 102

\*Ingersoll-Rand Co. ("Cameron"), 11 Broad-  
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\*Morris Machine Works, Baldwinsville, N. Y. . . . . 141

\*Pennsylvania Pump & Compressor Co.,  
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\*Roots-Connorsville Blower Corp'n, 16th St.  
& Columbia Ave., Connorsville, Ind. . . . . 180

\*Westco Pump Corp'n, Gains & Front Sts.,  
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\*Worthington Pump & Machinery Corp'n,  
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- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
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## PUMPS (Lift & Force)

- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115

## PUMPS (Milk)

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## PUMPS (Mine)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Barrett, Haentjens & Co. ("Hazleton"), Hazleton, Pa. 32, 33
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Dayton-Dowd Co., Quincy, Ill. 72
- \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74
- \*Dean Hill Pump Co., Anderson, Ind. 75
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- \*Morris Machine Works, Baldwinville, N. Y. 141
- \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.
- Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.
- Weinman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.

## PUMPS (Non-Clogging)

(See Pumps, Sand, Sewage, Sludge, Slurry, Soap, etc.)

## PUMPS (Oil)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*American Steam Pump Co., Battle Creek, Mich. 17
- \*Anthony Co., 47-33 Fifth St., Long Island City, N. Y. 20
- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Burt Mfg. Co., 605 Main St., Akron, Ohio. 46
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Dayton-Dowd Co., Quincy, Ill. 72
- \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74
- \*Dean Hill Pump Co., Anderson, Ind. 75
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Gasco Pump & Burner Mfg. Co., Tulsa, Okla. 95
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134
- \*Morris Machine Works, Baldwinville, N. Y. 141
- \*National Airoil Burner Co., 1327 Girard Ave., Philadelphia, Pa. 148
- \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185
- \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.
- Oil Conservation Engineering Co., 877 Addison Road, Cleveland, Ohio.
- Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.
- Weinman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.
- Viking Pump Co., Cedar Falls, Iowa.

## PUMPS (Oil, Force Feed)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45

- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- American Fluid Motors Co., 2412 Aramingo Ave., Philadelphia, Pa.
- Manzel Brothers Co., 322 Babcock St., Buffalo, N. Y.

## PUMPS (Oil, Hand)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134
- \*Lonergan, J. E. Co., 211-217 Race St., Philadelphia, Pa. 137

## PUMPS (Oil Pipe Line)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Gasco Pump & Burner Mfg. Co., Tulsa, Okla. 95
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- \*National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.

## PUMPS (Oil, Rodline)

- \*Gasco Pump & Burner Mfg. Co., Tulsa, Okla. 95

## PUMPS (Oil, Variable Delivery)

- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- American Fluid Motors Co., 2412 Aramingo Ave., Philadelphia, Pa.
- Hydraulic Press Mfg. Co., 500 Lincoln Ave., Mt. Gilead, Ohio.
- Waterbury Tool Co., Waterbury, Conn.
- Weinman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.

## PUMPS (Paper Pulp)

(See Pumps, Stuff)

## PUMPS (Pneumatic Pressure)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*United States Hoffman Machinery Corp'n, 103 Fourth Ave., New York, N. Y. 210
- Crowell Mfg. Co., 319 Franklin Ave., Brooklyn, N. Y.
- Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Portable)

(See Pumping Outfits)

## PUMPS (Power)

- \*American Steam Pump Co., Battle Creek, Mich. 17
- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Dean Brothers Co., 331 W. Tenth St., Indianapolis, Ind. 74
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Gasco Pump & Burner Mfg. Co., Tulsa, Okla. 95
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co. ("Cameron"), 11 Broadway, New York, N. Y. 115
- \*Kraissl Co. (Inc.), Harper Terminal, Hackensack, N. J. 134
- \*Morris Machine Works, Baldwinville, N. Y. 141
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.
- Viking Pump Co., Cedar Falls, Iowa.

## PUMPS (Rotary)

- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Kraissl Co. (Inc.), Harper Terminal, 622 Main St., Hackensack, N. J. 134
- \*Roots-Connorsville Blower Corp'n, 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa. 185
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- American Fluid Motors Co., 2412 Aramingo Ave., Philadelphia, Pa.
- National Transit Pump & Machine Co., 19 N. Petroleum St., Oil City, Pa.
- Oil Conservation Engineering Co., 877 Addison Road, Cleveland, Ohio.
- Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.
- Viking Pump Co., Cedar Falls, Iowa.
- Waterbury Tool Co., Waterbury, Conn.
- Waterous Co., St. Paul, Minn.

## PUMPS (Sand)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Barrett, Haentjens & Co. ("Hazleton"), Hazleton, Pa. 32, 33
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Morris Machine Works, Baldwinville, N. Y. 141
- Ellicott Machine Corp'n, 1611 Bush St., Baltimore, Md.
- Willey, A. R. & Sons (Inc.), P. O. Box 2330, Denver, Colo.

## PUMPS (Sanitary, Dismountable)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*Beach-Russ Co., 46 Church St., New York, N. Y. 37
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Dayton-Dowd Co., Quincy, Ill. 72
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Pennsylvania Pump & Compressor Co., Easton, Pa. 163
- \*Westco Pump Corp'n, Gains & Front Sts., Davenport, Iowa. 213
- Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.

## PUMPS (Screw)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Morris Machine Works, Baldwinville, N. Y. 141
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Quimby Pump Co. (Inc.), 339 Thomas St., Newark, N. J.

## PUMPS (Seepage)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*American Steam Pump Co., Battle Creek, Mich. 17
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Chain Belt Co. ("Rex"), 1630 W. Bruce St., Milwaukee, Wis. 52
- \*Chicago Pump Co. ("Little Giant"), 2334 Wolfram St., Chicago, Ill. 56
- \*Dayton-Dowd Co., Quincy, Ill. 72
- \*DeLaval Steam Turbine Co., Trenton, N. J. 73
- \*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill. 81
- \*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 85
- \*Goulds Pumps (Inc.), Seneca Falls, N. Y. 102
- \*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115
- \*Morris Machine Works, Baldwinville, N. Y. 141
- \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219
- Pulsometer Steam Pump Co., 485 S. 21st St., Irvington, N. J.
- Weinman Pump Mfg. Co., 270-280 Spruce St., Columbus, Ohio.
- Yeomans Brothers Co., 1433 Dayton St., Chicago, Ill.

## PUMPS (Sewage)

- \*Allis-Chalmers Mfg. Co., Milwaukee, Wis. 4, 5, 6, 7
- \*American Steam Pump Co., Battle Creek, Mich. 17
- \*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45
- \*Chicago Pump Co., 2334 Wolfram St., Chicago, Ill. 56
- \*Connorsville Blower Co., 16th St. & Columbia Ave., Connorsville, Ind. 180
- \*Dayton-Dowd Co., Quincy, Ill. 72
- \*Dean Hill Pump Co., Anderson, Ind. 75
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\*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill. 1  
\*Farrel-Birmingham Company (Inc.), 348 Vulcan St., Buffalo, N. Y. 87  
\*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill. 90  
\*Grant Gear Works, Second & B Sts., Boston, Mass. 103  
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\*Barrett-Cravens Co., 3274 W. 30th St., Chicago, Ill. 34  
Brown Engineering Co., 121 N. Third St., Reading, Pa.

**RACKS (Storage, Barrel)**  
\*Barrett-Cravens Co., 3274 W. 30th St., Chicago, Ill. 34

**RACKS (Storage, Core)**  
\*Barrett-Cravens Co., 3274 W. 30th St., Chicago, Ill. 34  
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\*Barrett-Cravens Co., 3274 W. 30th St., Chicago, Ill. 34  
\*Cleveland Wire Spring Co., 1281 E. 38th St., Cleveland, Ohio 57  
\*Kirk & Blum Mfg. Co., 2871 Spring Grove Ave., Cincinnati, Ohio 133

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Gisholt Machine Co., Madison, Wis.

**REAMERS (Oil Well)**  
Hughes Tool Co., Houston, Texas.

**REAMERS (Plain, Machine and Hand)**  
Conant & Donelson Co., Conway, Mass.  
O. K. Tool Co. (Inc.), Shelton, Conn.

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\*Ingersoll-Rand Co., 11 Broadway, New York, N. Y. 115  
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Seamless Steel Equipment Corp'n., 39 Broadway, New York, N. Y.

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Hilliard Corp'n., 104 W. 4th St., Elmira, N. Y.

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## SCALES (Paper, Basis Weight)

\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85

## SCALES (Platform)

\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85  
Chatillon, John & Sons, 85 Cliff St., New York, N. Y.  
Exact Weight Scale Co., 844 W. Fifth Ave., Columbus, Ohio.  
Jacobs Bros. Co. (Inc.), 26 Washington St., Brooklyn, N. Y.

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## SCALES (Railroad Track)

\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85

## SCALES (Sacking)

\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85  
Exact Weight Scale Co., 844 W. Fifth Ave., Columbus, Ohio

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\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85  
Exact Weight Scale Co., 844 W. Fifth Ave., Columbus, Ohio  
Jacobs Bros. Co. (Inc.), 26 Washington St., Brooklyn, N. Y.

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\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85

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\*Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.                      85

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*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59
*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
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*Permutit Co., 330 W. 42nd St., New York, N. Y.	164
Elgin Softener Corp'n, Elgin, Ill.	
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*Permutit Co., 330 W. 42nd St., New York, N. Y.	164
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National Bearing Metals Corp'n, 4930-42 Manchester Ave., St. Louis, Mo.	
<b>SOLDER (Silver)</b>	
Wilson, H. A., Co., 97 Chestnut St., Newark, N. J.	
<b>SOLDERING IRONS (Electric)</b>	
*General Electric Co., 1 River Road, Schenectady, N. Y.	98, 99, 100, 101
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*Magnetic Mfg. Co. ("Stearns High Duty"), 614 S. 29th St., Milwaukee, Wis.	139
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*Bartlett Hayward Co., Scott & McHenry Sts., Baltimore, Md.	35
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*Farrel-Birmingham Company (Inc.), 348 Vulcan St., Buffalo, N. Y.	87
*Glover Machine Works, Marietta, Ga.	91
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Hart, Frederick, & Co. (Inc.), Box "H", Poughkeepsie, N. Y.	
Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio	
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*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill.	1
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*Abart Gear & Machine Co., 4837 W. 16th St., Cicero, Ill.	1
*Allis-Chalmers Mfg. Co., Milwaukee, Wis.	4, 5, 6, 7
*Falk Corp'n, Milwaukee, Wis.	88
*Foote Gear Works (Inc.), 11301 S. Cicero Ave., Cicero, Ill.	90
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Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
St., Cleveland, Ohio .... 57  
Cook Spring Co. Div. Barnes-Gibson-Ray-  
mond (Inc.), Ann Arbor, Mich.  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

**SPRINGS (Car & Locomotive)**

American Spiral Spring & Mfg. Co., 56th  
& A. V. R. R., Pittsburgh, Pa.  
Fort Pitt Spring Co., P. O. Box 917, Pitts-  
burgh, Pa.

**SPRINGS (Clutch)**

\*Cleveland Wire Spring Co., 1281 E. 38th  
St., Cleveland, Ohio .... 57  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
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American Spiral Spring & Mfg. Co., 56th  
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American Spring & Mfg. Corp'n, Holly,  
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Cook Spring Co. Div. Barnes-Gibson-Ray-  
mond (Inc.), Ann Arbor, Mich.  
Fort Pitt Spring Co., P. O. Box 917,  
Pittsburgh, Pa.  
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lyn, N. Y.  
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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
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\*Cleveland Wire Spring Co., 1281 E. 38th  
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mond (Inc.), Ann Arbor, Mich.  
Fort Pitt Spring Co., P. O. Box 917, Pitts-  
burgh, Pa.  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
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American Spring & Mfg. Corp'n, Holly,  
Mich.  
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mond (Inc.), Ann Arbor, Mich.  
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lyn, N. Y.

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\*Cleveland Wire Spring Co., 1281 E. 38th  
St., Cleveland, Ohio .... 57  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

**SPRINGS (Leaf, Vehicle, etc.)**

Fort Pitt Spring Co., P. O. Box 917, Pitts-  
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**SPRINGS (Machinery)**

\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
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mond (Inc.), Ann Arbor, Mich.  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

**SPRINGS (Nickel-Copper)**

\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
Cook Spring Co. Div. Barnes-Gibson-Ray-  
mond (Inc.), Ann Arbor, Mich.  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
lyn, N. Y.

**SPRINGS (Phosphor-Bronze)**

\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
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\*Cleveland Wire Spring Co., 1281 E. 38th  
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mond (Inc.), Ann Arbor, Mich.

**SPRINGS (Vanadium)**

\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
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Cook Spring Co. Div. Barnes-Gibson-Ray-  
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Lee Spring Co. (Inc.), 30 Main St., Brook-  
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\*Barnes-Gibson-Raymond (Inc.), 6400 Miller  
Ave., Detroit, Mich. .... 31  
\*Cleveland Wire Spring Co., 1281 E. 38th  
St., Cleveland, Ohio .... 57  
Cook Spring Co. Div. Barnes-Gibson-Ray-  
mond (Inc.), Ann Arbor, Mich.  
Lee Spring Co. (Inc.), 30 Main St., Brook-  
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General Alloys Co., Boston, Mass.

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\*Abart Gear & Machine Co., 4837 W. 16th  
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**SPROCKETS (Chain, Roller)**

\*Abart Gear & Machine Co., 4837 W. 16th  
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- Riehle Bros. Testing Machine Co., 1424 N. 9th St., Philadelphia, Pa.

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## TESTING MACHINES (Mechanical Properties, Universal)

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# U

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# V

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*Chaplin-Fulton Mfg. Co. ("Fulton"), 28-40 Penn Ave., Pittsburgh, Pa.	53
*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill.	71
*Foster Engineering Co., 109-113 Monroe St., Newark, N. J.	92
*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y.	131

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*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill.	51
*Consolidated Ashcroft Hancock Co. (Inc.), Bridgeport, Conn.	64, 65
*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
*Edward Valve & Mfg. Co. (Inc.), The, East Chicago, Ind.	82
*Everlasting Valve Co., 49-65 Fisk St., Jersey City, N. J.	84
*Foster Engineering Co., 109-113 Monroe St., Newark, N. J.	92
*Jenkins Bros., 80 White St., New York, N. Y.	122, 123
*Longman, J. E., Co., 211-217 Race St., Philadelphia, Pa.	137
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*Consolidated Ashcroft Hancock Co. (Inc.), ("Hancock"), Bridgeport, Conn.	64, 65
*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69

*Crosby Steam Gage & Valve Co., 10 Roland St., Boston, Mass.	70
*Edward Valve & Mfg. Co. (Inc.), The, East Chicago, Ind.	82
*Elmes, Charles F., Engrg. Works, 215 N. Morgan St., Chicago, Ill.	84
*Everlasting Valve Co., 49-65 Fisk St., Jersey City, N. J.	84
*Fairbanks Co., 393-399 Lafayette St., New York, N. Y.	97
*Jarecki Mfg. Co., Erie, Pa.	118
*Jenkins Bros., 80 White St., New York, N. Y.	122, 123
*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio.	161
*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa.	185
*Vogt, Henry, Machine Co., Louisville, Ky.	212

Central Valve Mfg. Co., 231 E. 95th St., Chicago, Ill.  
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*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill.	51
*Chaplin-Fulton Mfg. Co. ("Fulton"), 28-40 Penn Ave., Pittsburgh, Pa.	53
*Cochrane Corp'n ("Cochrane") ("Multiport"), 3142 N. 17th St., Philadelphia, Pa.	59
*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill.	71
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*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa.	185
*Stickle Steam Specialties Co., Indianapolis, Ind.	191

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*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill.	71
*Foster Engineering Co., 109-113 Monroe St., Newark, N. J.	92
*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y.	131
*Ruggles-Klingemann Mfg. Co., Salem, Mass.	181
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*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill.	51
*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill.	71
*Economy Pumping Machinery Co., 3431 W. 48th Place, Chicago, Ill.	81
*Edward Valve & Mfg. Co. (Inc.), The, East Chicago, Ind.	82
*Foster Engineering Co., 109-113 Monroe St., Newark, N. J.	92
*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y.	131
*Northern Equipment Co. ("Copes"), 2340 Grove Drive, Erie, Pa.	155
*Ruggles-Klingemann Mfg. Co., Salem, Mass.	181
*Schutte & Koerting Co., 1165 Thompson St., Philadelphia, Pa.	185
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*Swartwout Co., 18537 Euclid Ave., Cleveland, Ohio.	201

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*Crane Co., 836 S. Michigan Ave., Chicago, Ill.	68, 69
*Fairbanks Co., 393-399 Lafayette St., New York, N. Y.	97
*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio.	161

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*Beach-Russ Co., 46 Church St., New York, N. Y.	37
*Cochrane Corp'n, 3142 N. 17th St., Philadelphia, Pa.	59
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 \*Yarnall-Waring Co. ("Yarway"), 7603-20 Queen St., Chestnut Hill, Philadelphia, Pa. 222  
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 \*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
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\*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
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## VALVES (Diverting, Powdered Material Pipe Line)

\*Babeock & Wilcox Co., 85 Liberty St., New York, N. Y. 22, 23, 24, 25  
 \*Everlasting Valve Co., 49-65 Fisk St., Jersey City, N. J. 84  
 \*Whiting Corp'n, 15627 Lathrop Ave., Harvey, Ill. 216, 217

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 \*Edward Valve & Mfg. Co. (Inc.), The, East Chicago, Ind. 82  
 \*Everlasting Valve Co., 49-65 Fisk St., Jersey City, N. J. 84  
 \*Foster Engineering Co., 109-113 Monroe St., Newark, N. J. 92  
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 \*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
 \*Kieley & Mueller (Inc.), 34 W. 13th St., New York, N. Y. 131  
 \*Northern Equipment Co. ("Copes"), 2340 Grove Drive, Erie, Pa. 155  
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Automatic Temperature Control Co. (Inc.), 36 E. Logan St., Philadelphia, Pa.  
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 Hannifin Mfg. Co., 621 S. Kolmar Ave., Chicago, Ill.  
 Ludlow Valve Mfg. Co., Troy, N. Y.  
 Nicholson, W. H. & Co., 134 Oregon St., Wilkes-Barre, Pa.  
 Penn Electric Switch Co., Des Moines, Iowa.  
 Supreme Electric Products Corp'n, 79 Mt. Hope Ave., Rochester, N. Y.

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\*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69  
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\*Beach-Russ Co., 46 Church St., New York, N. Y. 37  
 \*Cochrane Corp'n ("Cochrane"), 3142 N. 17th St., Philadelphia, Pa. 59  
 \*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69  
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 \*United States Hoffman Machinery Corp'n, 103 Fourth Ave., New York, N. Y. 210  
 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

## VALVES (Expansion, Refrigerator)

Mueller Brass Co., 1925 Lapeer Ave., Port Huron, Mich.

## VALVES (Float)

\*Cash, A. W., Co., 16th & Eldorado Sts., Decatur, Ill. 51  
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\*Buffalo Pumps (Inc.), 495 Broadway, Buffalo, N. Y. 45  
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 \*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
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 \*Worthington Pump & Machinery Corp'n, Harrison, N. J. 219

Ludlow Valve Mfg. Co., Troy, N. Y.  
 Nicholson, W. H. & Co., 134 Oregon St., Wilkes-Barre, Pa.  
 Walworth Co., 60 E. 42nd St., New York, N. Y.

## VALVES (Four-Way)

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 \*Ruggles-Klingemann Mfg. Co., Salem, Mass. 181  
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 Nicholson, W. H. & Co., 134 Oregon St., Wilkes-Barre, Pa.

## VALVES (Gas)

\*Bartlett Hayward Co., Scott & McHenry Sts., Baltimore, Md. 35  
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## VALVES (Gas, Automatic Cut-Off)

\*Chaplin-Fulton Mfg. Co. ("Fulton"), 28-40 Penn Ave., Pittsburgh, Pa. 53  
 \*Davis Regulator Co., 2547 S. Washtenaw Ave., Chicago, Ill. 71  
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 Central Valve Mfg. Co., 231 E. 95th St., Chicago, Ill.  
 Walworth Co., 60 E. 42nd St., New York, N. Y.

## VALVES (Globe, Packless)

\*Crosby Steam Gage & Valve Co., 10 Roland St., Boston, Mass. 70

## VALVES (Hose)

\*Crane Co., 836 S. Michigan Ave., Chicago, Ill. 68, 69  
 \*Fairbanks Co., 393-399 Lafayette St., New York, N. Y. 97  
 \*Jenkins Bros., 80 White St., New York, N. Y. 122, 123  
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 \*Hunt, Rodney, Machine Co., 80 River St., Orange, Mass. 114  
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\*Consolidated Ashcroft Hancock Co. (Inc.), ("Hancock"), Bridgeport, Conn. 64, 65  
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 \*Jenkins Bros., 80 White St., New York, N. Y. 122, 123  
 \*Parker Appliance Co., 10320 Berea Road, Cleveland, Ohio. 161  
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			<b>*Roebbing's, John A., Sons Co., Trenton, N. J. ....</b>			<b>179</b>
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			<b>*General Electric Co., 1 River Road, Schenectady, N. Y. ....</b>			<b>98, 99, 100, 101</b>
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**WIRE ROPE**

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**WRENCH SETS (Socket, Ratchet)**

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

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**WRENCHES (Drop Forged)**

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**WRENCHES (Pipe)**

Walworth Co., 60 E. 42nd St., New York, N. Y.

**WRENCHES (Ratchet)**

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

**WRENCHES (Socket)**

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

**WRENCHES (Structural)**

Lowell Wrench Co., 54 Commercial St., Worcester, Mass.

**WRENCHES (Tap)**

Conant & Donelson Co., Conway, Mass.

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